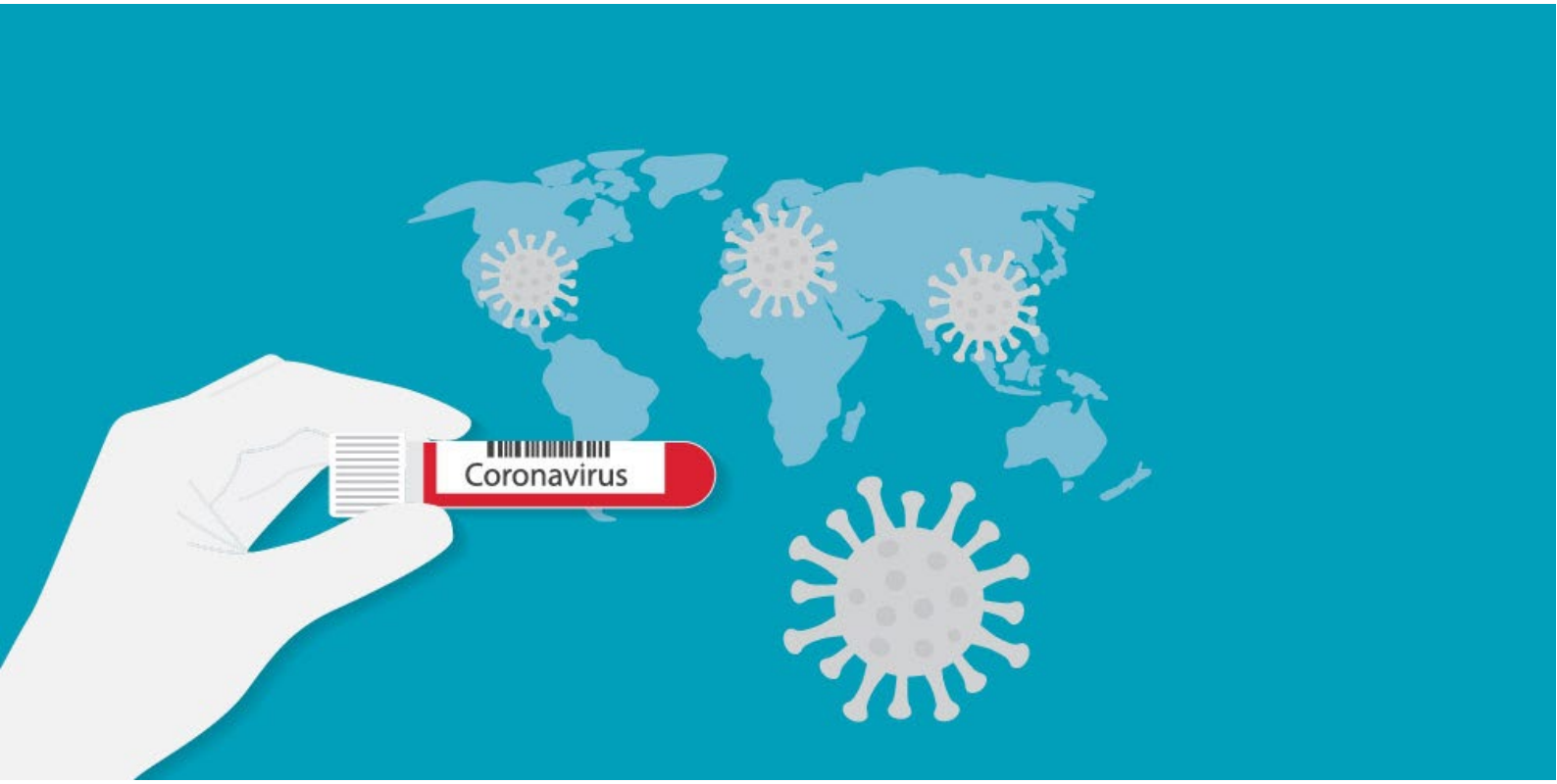
COVID-19 POLICY RESPONSE IN EUROPE AND ASIA: AN INTERNATIONAL COMPARISON

A Qualitative Comparative Analysis on policy responses during the first wave of COVID-19 between countries with SARS-CoV-1 exposure and countries without, identifying trends and exploring possible explanations



MSc Thesis

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Preface

The year 2020 will be characterized as an unusual year for people, governments, and countries. COVID-19 spread rapidly across the globe, with enormous implications for all of society. The quality of life is directly affected. The need for public health measures that could alleviate the pressure of heath care systems and reduce the spread became clear. However, these measures had enormous economic implications, and were characterised by high levels of uncertainty. My strong interest in multi-disciplinary and complex problems, combined with my academic background, triggered me to explore the subject further. Communicable diseases already captured my interest during my BSc Health and Society thesis and continued to do so during my MSc Communication, Health and Life Sciences. Being a student in times of a pandemic allowed me to translate my interests into practice and continue to study the subject that held and still holds back so many.

Abstract

Background: In December 2019, a novel kind of coronavirus was identified (C. C. M. Lee et al., 2020). Upon extensive spreading of this virus spread, the World Health Organization (WHO) declared the coronavirus disease 2019 (COVID-19) a pandemic. During the pandemic, it became clear that the countries that were initially considered to be best prepared, were not the ones with the most effective response as expressed by the number of COVID-19 cases (Kavanagh & Singh, 2020).

Aim: This research aims to gain insights into how and to what extent pandemic preparedness and COVID-19 responses of countries differentiate or share similarities and what might be possible explanations for COVID-19 policy performance and policy convergence or divergence across countries.

Methods: Theories and frameworks that provided possible explanations for COVID-19 performance or response resulted in a conceptual model with three possible and interdependent explanations: initial departure system, experience with SARS1 in 2003, and policy learning and adjustment. A Qualitative Comparative Analysis was conducted following a most similar systems design but with different outcomes. Assuming that prior exposure to SARS1 in 2003 might have led to different levels of initial preparedness between Asia and Europe, two groups are analyzed 1) Vietnam, South Korea and Singapore as the deviant control case in Asia and 2) Belgium and the UK with Germany as a deviant control case in Europe. To assess preparedness, the six National Pandemic Response Plans were assessed quantitatively and qualitatively on the categories identified in the literature study. Literature study and the use of international publicly available COVID-19 response databases guided the analysis of similarities and differences within and between the two groups, among which the Containment and Health Index of the Oxford COVID-19 Government Response Tracker.

Results: Pandemic plans are only to a limited extent predictive of COVID-19 policy performance. Alternative explanations for the level of COVID-19 policy performance are found in A) the initial departure system (i.e. procurement and availability of protective and testing equipment; as well as a level of general sense of urgency and NPI compliance). B) The relationship between preparedness and prior exposure to SARS1 in 2003 and COVID-19 performance is confirmed, although deviant cases show this is not a sufficient predictor of policy adequacy. C) A last possible explanation for policy performance is the extent to which countries can learn from both experiences and other countries' policies in four different loops. The Oxford Stringency Index shows a visible convergence trend which is, to a limited extent, stronger in Europe than in Asia, and mainly during stages of new outbreaks. Divergence is visible more in Asia and more during stages of policy relaxation and the release of public restrictions.

Conclusion: Differences in performance seem to associated with strategy, state capacity differences in organizations structures, power shifts and legislation. These in turn can aid or limit effective COVID-19 policy responses. Based on the literature, Asian countries were better prepared due to previously learned lessons from SARS-CoV-1, which led to increased (state) capacities and supporting departure systems for effective COVID-19 policy response during the first wave of COVID-19.

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ACRONYMS AND ABBREVIATIONS

WHO	World Health organisation
NPPRP	National Pandemic Preparedness and Response Plan
NPI	Non-Pharmaceutical interventions
ECDC	European Centres for Disease Prevention and Control
CDC	U.S Centres for Disease Control and Prevention
DCI	Daily Cumulative Incidence
QCA	Qualitative Comparative Analysis
ASEAN	Association of Southeast Asian Nations
HSRM	Health System Response Monitor
OxCGRT	The Oxford Government Response Tracker
KCDC	Korean Disease Control and Prevention Agency
MoH	Ministry of Health
TTIS systems	test-trace-isolate-support systems
PPP	Public Private Partnerships
NSC	National Security Council
FTIS	Finding, testing, tracing, isolation and supporting

1. Introduction

1.1 BACKGROUND

1.1.1 COVID-19

In December 2019, a novel kind of coronavirus was identified (C. C. M. Lee et al., 2020). Upon extensive spreading of this virus, the World Health Organization (WHO) declared the coronavirus disease 2019 (COVID-19) a pandemic. During the first wave of this pandemic, it became clear that the countries considered best prepared were not the ones with the most effective response, as expressed by the number of COVID-19 cases (Kavanagh & Singh, 2020). After SARS-CoV-1 emerged in 2003, the International Health Regulations were revised in 2005 to strengthen core public health and disease response capacities. However, expectations based on pandemic preparedness assessments, such as the Global Health Index, do not match performance during the first wave of COVID-19 (Kavanagh & Singh, 2020). This provides momentum to reflect on how and if previous experiences have shaped preparedness and actual responses

Now that time has passed since the initial onset of COVID-19, and the first wave has come to an end, public health researchers are granted the opportunity to comprehend why and how countries have responded. Furthermore, it provides an opportunity to look into how countries were prepared through their national preparedness and response plans, which include recommended actions for preparations to such events (WHO,2005), their actions during the first wave of the pandemic, and why they were responded as they did. According to Hanvoravongchai et al. (2010), prior exposure to pandemics, and the threat for future ones, leads to active investments in pandemic preparedness plans and helps to translate these strategic plans into operational plans. The variance in case distributions worldwide, with fewer cases in Asia, raises the question of whether and how prior exposure in this area also led to better performance. Prior exposure in Asia could have resulted from its severe exposure with SARS-COV-1 leaving deep imprints in both affected populations and governments, according to Ru, Yang, & Zou (2021).

1.1.2 SARS-COV-1 (2002-2004)

COVID-19, officially named SARS-CoV-2, belongs to the group of coronaviruses and is not the first of its kind to emerge in the past few years. SARS-CoV-1 in 2003 (SARS-CoV-1) and the Middle Eastern Respiratory Disease in 2012 (MERS-CoV) already preceded COVID-19 this century (Shannon & Willoughby, 2004). As the name implies, SARS-CoV-1 shares characteristics with SARS-CoV-2 or COVID-19. SARS-CoV-1 and SARS-CoV-2 belong to the same subgroup of coronaviruses, causing respiratory infections (Kaul, 2020).

In contrast to the low prevalence of COVID-19 in Asia are the relatively high numbers associated with SARS-CoV-1. Numbers that the WHO reported until the seventh of August 2003 indicate a total of 8,422 probable cases of SARS worldwide (WHO, 2003). Approximately 96 per cent of the world's total reported SARS-CoV-1 cases originated from Asia while accounting for 94 per cent of the total reported deaths (Shannon & Willoughby, 2004). The SARS-CoV-1 epidemic already showed that few countries were equipped with the required surveillance systems and response capacities to rapidly detect and control emerging infectious diseases (Peter & Horby, 2013). The 2003 SARS outbreak highlighted the need for increased urgency and provided momentum for change. The International Health Regulations were revised in 2005, in which a series of core capacities have been defined (Peter & Horby, 2013).

These refer to capacities required to establish, report, and control public health emergencies of international concern. The target for attaining these core capacities was June 2012 (Peter & Horby, 2013). Many improvements were made globally, strengthening core capacities in South-East Asia, under the influence of increased political and financial support regarding emerging infectious diseases after the outbreaks of SARS and avian influenza (H5N1). Surveillance and response capacities improved over the past years, and East and Southeast Asia are far better prepared to detect and respond to emerging infectious diseases (Peter & Horby, 2013). However, according to Peter & Horby (2013), the question also remains if prior exposure to SARS-CoV-1 had any lasting effect on the probability of new infectious agents being effectively controlled and to what extent these led to strategic enhancements in dealing with new threats.

1.2 PROBLEM STATEMENT

As described in the previous sections, differences in COVID-19 incidence and prevalence between countries and regions are noticeable. Europe and North America experienced a significantly larger number of cases than Asia. Although no two countries share identical healthcare systems or demographics, and discrepancies in data are likely to be present due to variations in test regimens and reporting practices, these differences remain remarkable (Roser, Ritchie, Ortiz-Ospina, & Hasell, 2020a). SARS-COV-1 in 2002-2004 also caused severe outbreaks; although significantly smaller in numbers, its case distribution was mainly centred around the Asian region. It is unclear to what extent SARS-CoV-1 has had any lasting effects on the effective control of SARS-COV-2 and to what extent it has led to strategic enhancements (Peter & Horby, 2013). In the absence of a vaccine and effective treatment, the focus of response is shifted towards prevention through non-pharmaceutical interventions, dependent on multiple actors and factors. The variance in response and outcome during the first wave of COVID-19 across countries is considered a motivation to explore how and if prior exposure to SARS-CoV-1 has been of value for SARS-CoV-2 (COVID-19) policy responses. Furthermore, it is addressed how these lessons and explorations could be translated into valuable lessons for future threats of emerging infectious diseases. Therefore, a qualitative comparative analysis will be executed to gain insights into preparation and established organizational infrastructure and pandemic responses by country governments. By comparing these amongst countries with different exposures to SARS-CoV-1 and COVID-19 performance, lessons and possible explanations could be identified.

1.3 AIM AND RESEARCH QUESTIONS

This research aims to gain insights into how and to what extent pandemic preparedness and COVID-19 responses of countries differentiate or share similarities and what might be possible explanations. To properly answer this question, the following sub-questions are used:

1. How can the pandemic response be conceptualized, and what are the components of an effective pandemic response?
2. What are the similarities and differences in pandemic plans and control systems in selected countries between countries with significant prior SARS-COV-1 experience in 2003 and without?
3. What are similarities and differences in actual policy responses and adaptations to COVID-19 prevalence between countries with significant prior SARS-COV-1 experience in 2003 and without?

4. How can we explain (a) differences in COVID-19 responses in Asian countries with prior SARS-COV-1 informed plans and control systems, (b) differences in European countries without significant prior exposure to SARS-COV-1, and (c) similarities between Asian and European countries?
5. What trend is observable since early 2020 between Asia and Europe of divergence or convergence of adaptive responses, as an indicator of possible cross-country policy learning, to fluctuations in the outbreak?

2. Theoretical framework

2.1 CONCEPTUALISATION AND COMPONENTS OF AN PANDEMIC RESPONSE

In this section, several theories and frameworks are elaborated upon that are used to guide the analysis of the research questions. These theories and frameworks are presented to on the one hand conceptualize and identify important components of effective pandemic response according to the literature, and on the other to guide the analysis of the research questions. Brief descriptions of effective pandemic responses and National Pandemic Preparedness and Response Plans are given to start. Following up, the 'public health emergency preparedness and response analysis framework' is presented. Next, three theories are presented that resulted in the conceptual model. Afterwards, the work of S. L. Greer, King, da Fonseca, & Peralta-Santos (2020) is presented, followed by the quadruple loop learning theory from Lee et al. (2020). The conceptual model is inspired by these theories, frameworks and country-specific literature. The conceptual model will guide the analysis in the last research question, exploring the possible explanations of COVID-19 response and performance. Finally, in order to assess the NPPRP's in the second research question, the tools of Droogers et al. (2019) and the ECDC (2017) are merged into a scoring tool which is presented at the end of this section.

What is a pandemic response?

When addressing diseases, two fundamental distinctions arise. The first is risk assessment, which includes identifying risks by understanding social and individual risk factors and evaluating the magnitude. The second one is the actual response, or the "risk management", which includes: vaccination, prevention, treatment, containment, and communications. (Greer & Maetzke, 2012). In the absence of a vaccine and treatment, the need for prevention in the form of Non-Pharmaceutical Interventions (NPI) increases (Babin, 2020) which is a part of risk management. The eradication of SARS-CoV-1 already was accomplished through NPI's before a vaccine was developed (Amanat & Krammer, 2020).

Non-pharmaceutical interventions (NPIs), or public health and social measures (PHSM), aim to prevent the establishment of infectious diseases. By limiting the spread, the burden on the health system can be reduced (Desvars-Larrive et al., 2020). During the COVID-19 Pandemic, governments have used a wide range of NPI's (Amanat & Krammer, 2020). These public health measures can be translated into forms of self-isolation, social distancing, masks, closing non-essential businesses and schools, and quarantine(Babin, 2020). These measures have also been implemented in most countries to decrease the prevalence and incidence of COVID-19. When adhered to, NPI's have successfully reduced virus transmissions (Babin, 2020). Even after the successful development of a vaccine, NPI's are needed to keep the adequate reproductive number (R0) below 1, which is an important goal in reducing transmission (Cevik, Marcus, Buckee, & Smith, 2020). However, the public restrictions and limitations can result in adverse economic impacts. Therefore, governments are challenged to consider what actions to take and when carefully. As a result, the need also increases on implementing NPIs properly (Babin, 2020).

Strategies

The literature pointed out that several strategies can be, and were, adopted during the first wave of COVID-19.

- An **elimination strategy** aims to stop incidence and to reduce numbers to zero or very low numbers, applying testing to identify new cases at an early stadium swiftly. Examples or countries that implemented this strategy are China and New-Zealand.
- The **containment strategy** is focused on, testing, tracking and tracing, and is complemented with .behaviour change interventions to reduce the spread. (Lu et al., 2021)
- The **mitigation strategy**: this strategy aims to reduce incidence in order to fit the capacity limit of the healthcare sector. Mitigation strategies reduce case numbers via moderate control measures. However, potentially leading to lockdowns when numbers rise and the capacity of health services is threatened (Lu et al., 2021)

The herd immunity strategy entails the sole protection of specific population groups who are at higher risk, while societal life remains largely normal, accepting larger numbers of cases. Elimination and containment strategies both require severe control measures, appropriate technology for tracing and testing, and strong political support. (Lu et al., 2021)

National Pandemic Preparedness and Response Plans

The goal of creating a national pandemic preparedness and response plan, including the recommended preparations and planning, is to enable countries to prepare and anticipate in advance. Preparation may help lower the transmission frequency of diseases, decrease the number of reported cases, minimize hospitalizations and deaths, and maintain essential services while minimizing both the economic and social impact that a pandemic could have (WHO, 2005).

Technical guidelines

According to the WHO (2018), the following elements should be covered in NPPRP's in the section 'preparing for an emergency': Planning, coordination and resources, Legal and policy issues, Ethical issues, Risk communication, Points of entry and Travel restrictions. To these risk management, preventing illness in the community, maintaining essential services and recovery and evaluating testing and revising plans are added, which are shortly elaborated upon below. These components are also included in the documents from the ECDC and the CDC describing components of NPPRPs.

Table 1: Key areas

Planning, coordination and resources	A clear division of tasks and recourses is essential. Ensuring that actors are aware of their roles and responsibilities, have capacities and resources, understand their role, and are capable of working together (WHO, 2018).
Legal and policy issues	the WHO described law as a crucial component when creating sound national policies which address pandemics, and underscores the necessity of a legal framework
Ethical issues	Ethical issues are in their turn essential when developing legal frameworks that are targeted at pandemics. Protecting health on the one hand and individual rights and freedom on the other.
Risk communication	According to the ECDC (2017) Risk communication is a crucial public health tool in pandemic planning and in the response to a pandemic.
Points of entry and travel restrictions	Points of entry are all the options one has to enter of leave a nation. These should be strengthened and process capacities in order to prevent, prepare for and respond to public health risks (WHO,2018).

Risk management and risk assessment	Countries might encounter non-identical risks, and are therefore encouraged to develop their own risk assessment guided by local circumstances, which in turn guides risk management and adaptability to different phases. (Wijesinghe, Ofrin, Bhola, Inbanathan, & Bezbaruah, 2020).
Surveillance	Pandemic responses will be based on surveillance, which is essential to provide information and to pandemic preparedness (WHO, 2018; CDC,2017). All of the national documents should describe their current epidemiologic surveillance system.
Preventing illness in the community	Non-pharmaceutical interventions are the first line of defense in influenza pandemics and a critical element of pandemic preparedness (WHO,2017; CDC,2017, ECDC,2017). Effective implementation relies on public awareness, acceptance, intersectoral collaboration (WHO,2018)
Maintaining essential services and recovery	Communities require access to essential services in order to keep up welfare and stability in times of a pandemic (WHO, 2018; ECDC, 2017). Pandemic recovery actions should be balanced by preparedness activities to prepare for possible subsequent waves (WHO, 2018).
Evaluation, testing and revising plans.	Evaluation provides essential information regarding the effectiveness of pandemic preparedness, response and recovery activities.

Now that components of effective pandemic responses and plans have been described, the analytical framework to guide the analysis of the actual response will be elaborated upon below.

2.2 THE PUBLIC HEALTH EMERGENCY PREPAREDNESS AND RESPONSE ANALYSIS FRAMEWORK

During the literature review, a framework was found which was in line with the current research and was more suitable for reviewing the actual responses of countries. This framework, developed by He, Zhang, Mao, Degomme, & Zhang (2020), is called 'the public health emergency preparedness and response analysis framework' (Figure 1).

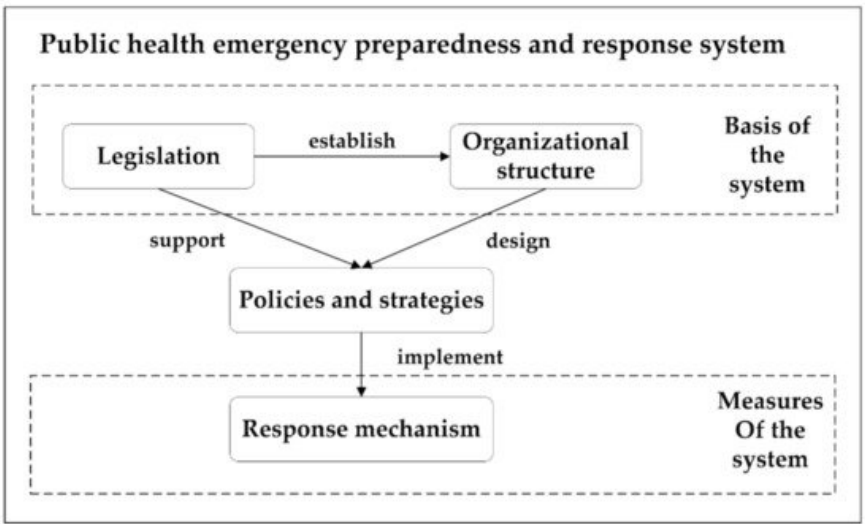


Figure 1: The public health emergency preparedness and response analysis framework (He et al., 2020)

This framework is based upon the Health EDRM Framework from the WHO (2019), a framework that defines the objectives, principles, and core components of preparedness and response to public health emergencies. While the Health EDRM Framework from the WHO provides a unified and clear approach that can be universally applied by those who aim to reduce health risks and consequences of emergencies, it does not lend itself to guiding an analysis. The public health emergency preparedness and response analysis framework is based upon the EDRM framework but was specifically created to guide an analysis of preparedness and response during COVID-19 (He et al., 2020).

The public health emergency preparedness and response analysis framework distinguishes four dimensional components (Figure 1). Firstly, legislation and organizational structure are presented, which are part of 'the basis of the system'. Secondly, policies and strategies are stated as essential components, and lastly, the measures of the system, which consists out of measures taken during the response, are posed to be critical to evaluate COVID-19 response (He et al., 2020).

Basis of the system

The basis of the system dimension is composed of two components. The first component is legislation, which refers to a series of laws and regulations that support the public health emergency response. The legislation provides necessary guarantees for the establishment and functioning of the system(He et al., 2020).

The second component is the organizational structure. This entails the administrative organizations at all levels. In this framework, the organizational structure includes organizations that implement public health emergency policies and strategies (He et al., 2020).

Policies and strategies

The authors do not specify policies and strategies. However, policies in this research will include those that focus on NPI's. The timing and stringency of policies also reveal information about the strategy used in its initial response and how these change over time. In this research, the use of resources, the timing and stringency of policies, and statements given on countries strategies will provide information.

Response mechanism

The authors define response mechanism as: 'a set of measures of the public health emergency management system, to implement policies and strategies.' In the specific case of the COVID-19 pandemic, this includes intersectoral collaboration, communication, emergency resources, planning, and information management (He et al., 2020).

This framework is rather descriptive and does not provide many leads to explanations in performance. Therefore, early theories on COVID-19 performance and policy response are consulted upon below.

2.3 EARLY THEORIES ON COVID-19 PERFORMANCE AND POLICY RESPONSES

This section will elaborate on existing theories that aid in understanding why outcomes might have differed within both groups. First, an elaboration is given on the comparative politics of COVID-19, in which Greer, King, da Fonseca, & Peralta-Santos (2020) distinguish four key area's to understand policy responses. Second, the "policy learning theory" from Park & Chung (2021) is elaborated upon, followed by the quadruple loop learning theory by Lee, Hwang, & Moon (2020). Both theories were applied to the case of South Korea by the authors. A theoretical framework will be created using insights and literature from previous chapters to explain why outcomes differed between the selected countries.

2.3.1 Comparative politics of COVID-19

Greer, King, da Fonseca, & Peralta-Santos (2020) pose that to understand the different responses to COVID-19, one needs to understand country policy and politics. Four key aspects are elaborated upon: (a) social policies to crisis management as well as recovery, (b) government regime type (democracy or autocracy), (c) formal political institutions (federalism, presidentialism), and (d) state capacity (control over health care systems and public administration).

They pose four broad hypotheses for research on COVID-19 political responses.

1. First, **social policy** matters to crisis management as well as recovery. Social and economic policy are essential parts of both response and recovery. Like physical distancing or lockdowns, authoritarian public health measures rely on societal compliance, even in non-authoritarian regimes. Communication, trust and a political economy are factors that facilitate compliance and feasibility of measures. The pre-existing social policies of the country and those as a response to COVID-19 will shape the extent of compliance with public health measures and life after the pandemic(S. L. Greer, E. J. King, et al., 2020).
2. The second hypothesis is that **regime type** matters, referring to the primary cluster of institutions in a state. This hypothesis suggests that authoritarian regimes are bad at maintaining the internal and external flow of good information, but only some are good at forceful action. Democratic regimes might have more difficulty taking forceful or even appropriate action but can benefit from better information flow and public trust. There is an echo of this regime effect within countries – leaders with an authoritarian approach in a democratic country will damage the flow of information(S. L. Greer, E. J. King, et al., 2020).
3. The third hypothesis is that formal **political institutions** matter, in which federalism is often linked to coordination problems.
4. Lastly, it is hypothesized that **state capacity** matters, including control over health care systems and public administration. It shapes what policymakers perceive as available options. In that sense, previous learning can increase the capacity for future pandemics by expanding or identifying the level of capacities. S. L. Greer, E. J. King et al. (2020) pose that there are four kinds of capacity that the state possesses: governance, surveillance, coercion, and social policy capacity. Governance entails the process of making and implementing decisions that influence the whole population. It also includes the ability to coordinate between governments, regions and lower levels. Surveillance includes collecting and analysing critical epidemiological data to guide public health decision-making, including testing and tracing. The state's legal authority and ability to enforce rules are described as the state's coercion capacity but is less focused on in this research. Lastly, social policies are referred to as a state capacity that matters during and before COVID-19. They were created

to improve the overall welfare of society. The pre-pandemic state and social policies matter because the conditions created can impact morbidity and mortality due to variance in health systems and inequalities. The social policy response during the pandemic can also affect health outcomes. However, how and when they are applied are factors that can influence the effectiveness of those capacities as well. The next part will pose a theory in which learning is described in the context of pandemics and how this can influence (future) response.

2.3.2 Policy learning theory

Park & Chung (2021) combine the policy feedback theory that originated from (Mettler and SoRelle, 2014) and complemented this with the notion that institutional changes are essential for effective and swift responses during pandemics. The policy feedback theory indicates that: 'precedence (Time 1) reshapes policy and politics, followed by a subsequent crisis (Time 2), and how the new political environment created as a result 'feeds' back into the creation of future policies'(Mettler and SoRelle, 2014). The authors applied this combined theory to South Korea's COVID-19 policy responses, and Park & Chung (2021) highlight that these previous policy experiences are tightly connected to institutional memories and policy learning. The authors complement this theory by emphasizing the importance of institutional changes in interpandemic periods (Park & Chung, 2021). To further investigate how, and if, intra (during the response) and interpandemic policy learning has occurred that influenced COVID-19 policy responses and performance, the quadruple loop learning theory is explored.

2.3.3 Quadruple loop learning

The quadruple loop learning theory from S. Lee et al. (2020) is based on the triple loop learning theory from Tosey, Visser, and Saunders (2012) and Kusters, Batjes, Wigboldus, Brouwers, & Baguma (2017). Lee et al. (2020), the authors of the 'Quadruple loop learning', highlight the importance of previously learned lessons and how they can reshape organizations enabling efficient and effective responses during COVID-19. It includes past experiences, political and social contexts and the unique problems that come with the specific COVID-19 disease characteristics. It complements the triple-loop learning theory by adding the dimension of learning during the event itself as well. The authors of the quadruple loop learning theory base their theory on the process of organizational learning. The four loops are shown in Figure 2. A distinction is made between the 'frontstage' and 'backstage',

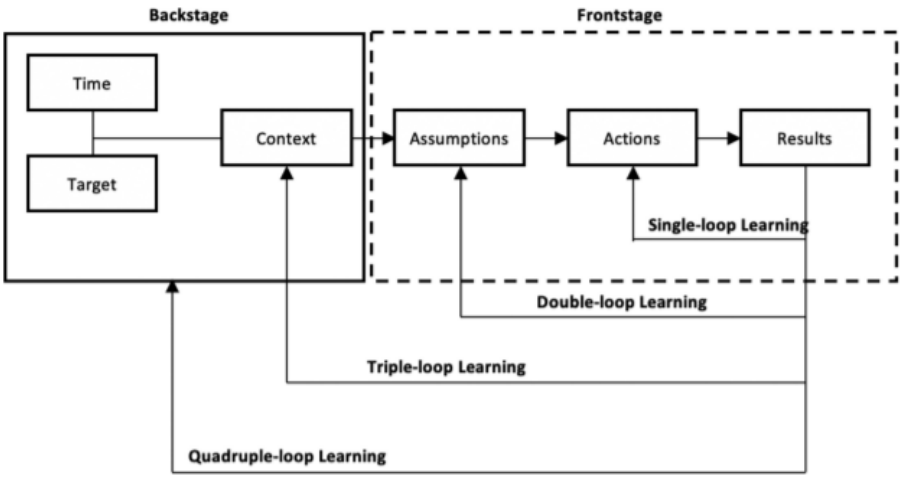


Figure 2: Quadruple-loop Learning (S. Lee et al., 2020)

which correspond to internal learning (frontstage) and responding to external changes, consisting of the target, the context and time. (backstage). These conditions influence the 'frontstage', which indicates that the process continues until solutions are implemented (S. Lee et al., 2020). The first loop, Single-loop learning, is most instrumental, direct action-focused. It is a process in which actors are fixed on "doing the right things to make things work'. Single-loop learning is the understanding of how instruments achieve objectives.

> *'First, in single loop learning, the relationship between actions and results provides and answer to problems, but in a superficial way' (S. Lee et al., 2020)*

Double-loop learning is referred to when assumptions are questioned and novel solutions are sought if deemed fit. This process still occurs within the organization and therefore does not entirely include changes in the external environment (S. Lee et al., 2020). Double-loop learning includes the reflection on outcomes, which can reveal how internal rules and procedures of the organization limit or hinder the achievement of goals.

> *'Unlike single-loop learning, which can only provide limited solutions, double-loop learning suggests better solutions by shedding light on changing assumptions that people to avoid the negative consequences of single-loop learning' (S. Lee et al., 2020)*

Triple loop learning occurs when factors in the external environment are considered, basing the response on more than previous experiences (single loop) or changing assumptions (double loop). It is the reflection on outcomes, which can reveal which structures limit or hinder goal achievements. The triple loop learning process entails the revaluation of, for example, structures and principles. This loop is required to create and adjust strategies that occur in a changing environment.

> *'In solving various problems, organizations often not only take actions based on standard operating procedures and previous experiences (single-loop) or change assumptions and principles, but also can reassess their culture, structures, principles, visions and even paradigms (triple-loop learning)' (S. Lee et al., 2020)*

This is where the model extends to quadruple loop learning because: "'Quadruple-loop learning happens when the nature of the new problem (target), context, and past experiences jointly affect a particular organization in the course of searching for solutions to an emerging problem.' (S. Lee et al., 2020). According to the authors, the contextual characteristics of an organization can stimulate or prevent organizational learning. The political context is essential to understand what type of crisis management is witnessed, whereas past policy experiences (time) are linked to institutional memories and policy learning. The type of government response relies on the type of crisis, how and when it adapts to changing circumstances.

In the opinion of Lee et al. (2020), the triple loop learning needed an addition because: "this model does not specify the linkage between context-specific learning mechanisms and double-loop learning. It also does not incorporate a continuous learning mechanism, which is a critical element in constantly searching for solutions under a high level of uncertainty and complexity.' They state that "The external environment and the organization interact with each other incessantly until a problem is solved. In this sense, it is necessary to revise, redefine, and expand current triple-loop learning." (S.Lee et al., 2020). They used the literature and applied it to the South Korean case, analyzing how

lessons learned from previous experiences forged its adaptive policies. They structure their theory by using a ”single, double, and triple-loop organizational learning as a basis for the quadruple-loop learning’ and forged it into a theoretical framework, which is shown below (S. Lee et al., 2020).

These theories provided the input for the conceptual framework below. By merging these theories into a conceptual framework, analysis of actual responses can be conducted while also exploring possible explanations for COVID-19 policy performance and responses.

2.3.4 Conceptual framework: exploring possible explanations

The conceptual framework is presented in Figure 3. However, pandemics and crisis management are complex and are influenced by a wide variety of factors. Therefore, it is essential to mention that this framework does not function as a predictive model. The framework helps explore explanations and should be regarded as such. It is based on the literature available when writing, and COVID-19 evaluations are still in their infancy. This conceptual model is explored by example and supported by previously found literature that elaborates on specific countries.

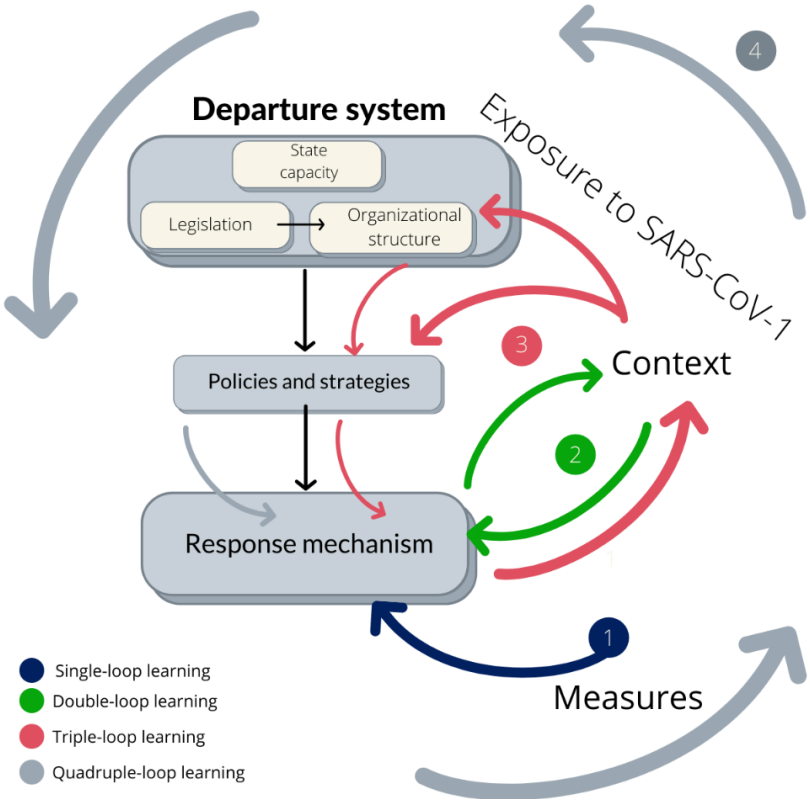


Figure 3:Conceptual framework

2.3.4.1 *Departure system*

The starting point is based upon the elements of the “ public health emergency preparedness and response analysis framework” framework developed by He, Zhang, Mao, Degomme, & Zhang (2020). Organizational structure and legislation enable and shape governmental policies response. In this conceptual framework, it refers to the departure system. It entails the system from which a country departs and is subject to changes over time. These changes can also include the pre-existing social or economic policies, regime type, formal political institutions and state capacity, as posed by Greer, E. J. King et al (2020). Furthermore, it entails how and if centralization or decentralization between or within governments occurs or is planned and how this plays out.

The initial departure system entails all the aspects that are present in terms of organizational structures and legislation, as posed by He et al. (2021) and forms of state capacity as posed by S. L. Greer, E. J. King et al. (2020), these include: governance, surveillance, coercion, and social policy capacity.

2.3.4.2 *Policy and strategy*

As posed by He et al. (2021), policies and strategies are influenced by the initial departure system, which eventually results in government policy responses.

2.3.4.3 *Response mechanism*

In the specific case of the COVID-19 pandemic, this includes, but is not limited to, intersectoral collaboration, communication, emergency resources, planning, and information management (He et al., 2020).

2.3.4.4 *Loops of learning*

During and prior to the response, four forms of learning can be witnessed. The four forms of learning are visualized by colored arrows.

1) Single loop learning includes the changes in actions, or in this case, policy responses. It can be seen as the (initial) COVID-19 responses and standard operating procedures based on past experiences.
2) Double loop leaning occurs when previous assumptions are reassessed, resulting into different actions. In this framework, it includes changing the assumptions and reassessing the (initial) COVID-19 responses and measures based on (new) insights to improve results
3) Triple loop learning occurs when the context in which the problems occur is taking into account, it can lead to the reassessment of cultures, structures, principles, visions and paradigms, and developing (new) strategies (S.Lee et al., 2020).
4) Finally, quadruple loop learning is a continuous learning mechanism where time, target (disease transmission dynamics) and contextual factors are translated into adaptive responses until the problem is solved.

2.3.4.5 *Exposure to SARS-CoV-1*

In this research, the effects of prior SARS-CoV-1 exposure is investigated to uncover how and if this has shaped COVID-19 response. Prior experience is posed to have an effect on resources, state capacity and strategy. Resources can be strengthened during interpandemic periods, and state capacities can be strengthened by feedback or experience, which in turn also influences how state capacities are used. For example, prior exposure can lead to structural changes in organizations, increased (excess) capacity, as posed by Woo (2020) in the form of policy, analytical, operational, political capacity. These capacities can influence and shape the initial response to future crises. An & Tang (2020) point out that pre-established institutional infrastructure, due to prior experience, can influence policy instruments' choices and effectiveness and widen the range of available (future) policies.

Experience also links to culture; it influences which policy options are seen as available options, based on prior experience or (societal) feedback, and compliance to governmental policies in turn can shape results. For example, Vietnam and South Korea applied extensive data collection and containment measures (Dinh & Ho, 2020; Oh, 2021). However, their methods of tracing might not be feasible or accepted in other countries initially. An & Tang (2020) point out that policy instruments

should resonate with the underlying culture, and need and risks should be examined to create practical long-term impacts. Ang & Tang state, 'the set of feasible policy instruments is inherently constrained by culture and must be adapted to it'.

The conceptual model is used to guide the analysis in the results section.

- 4.2.1 will provide a comparative analysis of policies, strategies and response mechanisms
- 4.2.2 gives insights into the initial departure system
- 4.2.3 provides a description how the exposure to SARS-CoV-1 (context)
- 4.2.4 will provide examples of the four loops of learning that can explain or describe policy responses and outcomes

3. Methodology

This chapter elaborates on the study design and the different methods used in this research to answer the research questions. First, this research design is elaborated upon, followed by the data collection. Next, the analysis is described, and, lastly, the validity and reliability are considered.

3.1 RESEARCH DESIGN

Answering the research question and sub-questions requires a Qualitative Comparative Analysis (QCA), analyzing and comparing pre-covid-19 and post SARS-CoV-1 documents that build the foundation for preparedness in the form of national pandemic response plans. Furthermore, analysis of the actual response of countries over time is required to gain insights into the similarities, differences and trends of policy responses. This qualitative data is preferably coded into themes or categories to set the foundation for a comparative analysis (Hewitt-Taylor, 2001). The selection of countries is based on the method described by Pattyn (2014) and Benoît Rihoux & Ragin (2008). After the selection, a choice between "most similar" and 'most different' systems design can be made (Benoît Rihoux & Ragin, 2008). This research lends itself to a most similar systems design. Lastly, the selection and argumentation of the countries and timeframe is given.

Qualitative Comparative Analysis

A QCA can be used for multiple purposes, including systematically structuring large quantities of qualitative data while uncovering patterns and differences between cases (Ragin, 2014). In doing so, it could be the basis of developing and identifying new theories or hypotheses(Benoît Rihoux & Ragin, 2008). While conducting a QCA, one considers the complex causality of cases in which causal relations are prone to multiple, contextual and asymmetrical factors. Causality in this analysis includes that the observed phenomena result from a combination of conditions. Different combinations can result in the same outcome. They can be asymmetrical, implying that the absence of a condition in one case can still lead to the same outcome in another (Verweij & Gerrits, 2012). In that sense, it differs significantly from the definition of causality used in statistical methods.

The first step is to create an overview of the different combinations of present conditions corresponding to the specific outcome and cases. The results of a QCA, containing differences and similarities, should be prone to further research, especially if contradictions are present. This research should be done by reinterpreting individual qualitative data of countries and reconsidering the theoretical concepts. To legitimize the scores, the researcher should know the cases in detail and interpret them multiple times (Verweij & Gerrits, 2012).

After analyzing the preparedness and response of countries with and without prior SARS-CoV-1 experience, adaptions to fluctuations in the outbreak are analyzed. Identifying whether the selected countries diverge or become more similar in responses, what might be influencing factors, and how countries adapt to the situation over time can provide insights into possible explanations of various outcomes. The lessons learned grant opportunities to seek improvement and make evidence-based alterations to properly prepare and adapt for future pandemics (ECDC, 2020). The choice of limiting the number of cases to be studied is due to the 'degrees of freedom problem', which revolves around the phenomenon of having many explanations and a small number of cases selected, explained by Campbell (1975). The article of Patyn (2014) discusses this problem in modern qualitative research concerning Most Similar Different Outcome and Most Different Same Outcome procedures (MSDO/MDSO). Whereas qualitative researchers often are advised to increase their number of cases

(N), this poses a challenge for qualitative researchers. This challenge could be due to the limited availability of suitable cases or the feasibility of the study. While reducing the number of cases might be preferred, reducing the number of variables that could explain the phenomenon should be done with caution. The MDSO/MSDO method is used to help limit the explanatory factors systematically and transparently. In this research two groups of countries with most similar systems are chosen to compare, but within these groups, there are differences in outcomes.

Most similar systems design

Based on the assumption that theoretically significant differences, which can be used in explanations, are present amongst similar cases, the choice for a most similar systems design is justified. Choosing similar cases lays the foundation for identifying and analyzing the remaining factors that differentiate the cases, excluding a lot of other factors that are shared (Benoît Rihoux & Ragin, 2008).

The goal of this design is twofold: the identification of factors that could explain why 1) similar cases have different outcomes and 2) why cases that deviate have the same outcome. However, this method will not lead to conclusions that imply causality but will emphasize the association of certain factors linked to a specific outcome. After selection and comparison, further analysis is recommended in the form of in-depth interviews or a QCA (Pattyn, 2014). The countries selected with large SARS-CoV-1 outbreak and management experience are compared with those who had less exposure under the initial hypothesis that they would perform better in COVID-19 policy response with experience. Control groups are added consisting out of countries that 1) have had SARS-CoV-1 experience but performed relatively less well and 2) did not have SARS-CoV-1 experience but performed relatively well.

However, looking at SARS-CoV-1 cases from the WHO (2003) and the data on cumulative COVID-19 from Roser et al. (2020a), this hypothesis would not suffice since significant differences in COVID-19 cases occur between countries with prior exposure. Singapore, Vietnam, South Korea, the USA and Canada all had relatively high SARS-CoV-1 prevalence, but not all performed well during COVID-19. On the other hand, countries that perform relatively well without exposure to SARS-CoV -1, like Germany and Denmark, are also present. Therefore, SARS-CoV 1 exposure alone cannot explain the significant differences. After the elaboration on the selection of countries, new hypotheses will be posed that can be investigated. The selection will consist of countries that performed relatively well and had SARS-CoV 1 experience (group 1) and a country that had comparable exposure but performed less (group 3). Furthermore, a country is selected that performed relatively well regarding COVI-19 but had no exposure to SARS-CoV 1 (group 2), and two countries that performed less and had not SARS-CoV 1 exposure (group 4).

This results in the design shown in table 1 and Figure 4.

Tabel 1: selection countries

	Experience SARS-CoV-1 +	**Experience SARS CoV-1 -**
COVID-19 performance +	1	2
COVID-19 performance -	3	4

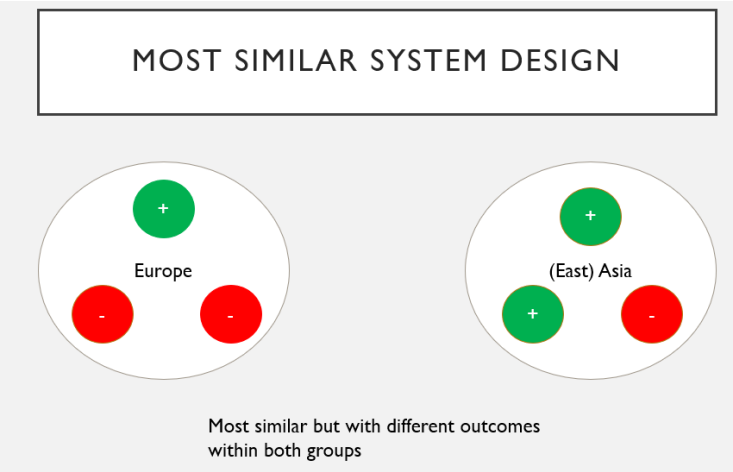


Figure 4: most similar system design

After choosing the research design, the countries corresponding to one of the four groups are selected in the next section.

Selection of countries

SARS-CoV-1 reached many countries, and in the aftermath, a great deal of attention has been given to pandemic preparedness. However, some regions of the world were more severely affected than others. Now that pandemic preparedness and response systems have been put to the test; it provides an opportunity to conduct a comparative analysis(Kavanagh & Singh, 2020). The selection of countries is based on the numbers provided by the WHO. The cases are divided into four groups, as shown in Table 1: Groups/Cases. The first group of cases is based on having experience with SAR-CoV-1 and performing relatively well during the first wave of Covid-19. The second group is based on having no or less exposure to SARS-CoV-1 and performing relatively worse during the first wave of COVID-19. Two groups remain, who could serve as control groups. The first group has experience with SARS-CoV-1 but does not perform well during the first wave of COVID-19, and the other group is based on having little to no exposure to SARS-CoV-1 but performing relatively well during the first wave of COVID-19.

Table 2: Categorization of countries

	Experience SARS-CoV-1	**No/Less experience**
Performing relatively well during COVID-19	1	2
Performing relatively worse during COVID-19	3	4

Based on data and scientific literature, the following countries are selected: South Korea, Vietnam, Singapore, Germany, UK and Belgium. The countries corresponding to the groups are shown below in table 3 and Figure 5. A detailed description of the selection methods and argumentation is given in appendix 7.1.1.

Table 3: Selected countries and corresponding group

	Experience SARS-CoV-1	**No/Less experience**
Performing relatively well during COVID-19	1) South Korea and Vietnam	2) Germany
Performing relatively worse during COVID-19	3) Singapore	4) UK and Belgium

In this selection, South Korea and Vietnam are compared to a control group. A single country, Singapore, forms this control group. Belgium and the UK are compared to the control group Germany. The selection is based on the exposure to SARS-CoV-1 (absolute numbers and geography), COVID-19 performance (based on cumulative cases per million and indicators/scores derived from literature). In this way, a systematic comparison can be made between most similar cases, in sub research questions 1,2 and 3, and most deviating cases in the last sub research question.

South Korea, Singapore and Vietnam are selected due to their SARS-CoV-1 experience, but they differ on performance outcomes in terms of COVID-19 cumulative cases. They are located in East Asia, and the first cases of COVID-19 were reported shortly after each other in each country. On the twentieth of January 2020, the first SARS-CoV 2case was reported in Korea, followed by Vietnam and Singapore, which reported their first case on the twenty-fourth of January (Kumar, Malviya, & Sharma, 2020). In the early phase of its emergence, less was known about the virus' characteristics. Furthermore, they share, on the one hand, cultural compatibility. On the other hand, institutional infrastructure is a result of previous experiences with SARS -CoV 1 and MERS (B. Y. An & S. Y. Tang, 2020). Lastly, Vietnam and Singapore are both parts of ASEAN, the association of Southeast Asian countries, sharing agendas for pandemic preparedness. South Korea is referred to as one of the ASEAN plus three (China, Japan and South Korea)(Djalante et al., 2020).

According to You (2020), South Korea governs by using a democratic unitary political system and centralized public health governance, which grants little autonomy to local governments. According to the authors, this results in rapid policy decisions as opposed to federal and decentralized governance structures. According to Linh, Hanh, & Shaw (2020), Vietnam is a socialist republic country operating with a one-party system, making it less complicated than operating within a multi-party political system. According to Woo (2020), Singapore is characterized by a high degree of centralization and single-party rule. With regard to health co-operations in Asia, the landscape is characterized by a diversity of organizations and fragmentation. Various organizations are active, including the Association of South-East Asian Nations (ASEAN), the South Asia Association for Regional Cooperation (SAARC) and the forum for Asia Pacific Economic Cooperation (APEC). Furthermore, the WHO regional office is present for the Western Pacific Region, including Vietnam, South Korea, and Singapore. (Liverani, Hanvoravongchai, & Coker, 2013). Out of these organizations, especially ASEAN, took a prominent role regarding coordination and regional activities. In response to the SARS-CoV-1 outbreak in 2003, it created the "The Emerging Infectious Disease Programme of ASEAN+3", stimulating increased efforts and regional cooperation concerning infectious disease control (Liverani et al., 2013).

The UK, Belgium and Germany did not have exposure to SARS-COV-1. However, Germany seems to has been lauded for its response (Dodds et al., 2020). Furthermore, all countries are EU members.

until recently, when the UK left during Brexit and the ECDC guided member states regarding pandemic response and preparedness and the development of plans(Nicoll, 2010). Belgium, Germany and the UK are considered federal states or quasi-federal states(Martin et al., 2010). Europe is characterized by increasing centralization, embodied in central agencies such as the European Commission and the ECDC (Liverani et al., 2013). Information on events and public health measures is provided and shared via the Early Warning Response System (EWRS). However, member states remain self-governing regarding public health crisis management. (Mahy et al., 2017). The organizational structure of national governments varies across European states. Belgium and Germany are considered federal states, the UK is quasi-federal (Martin et al., 2010).

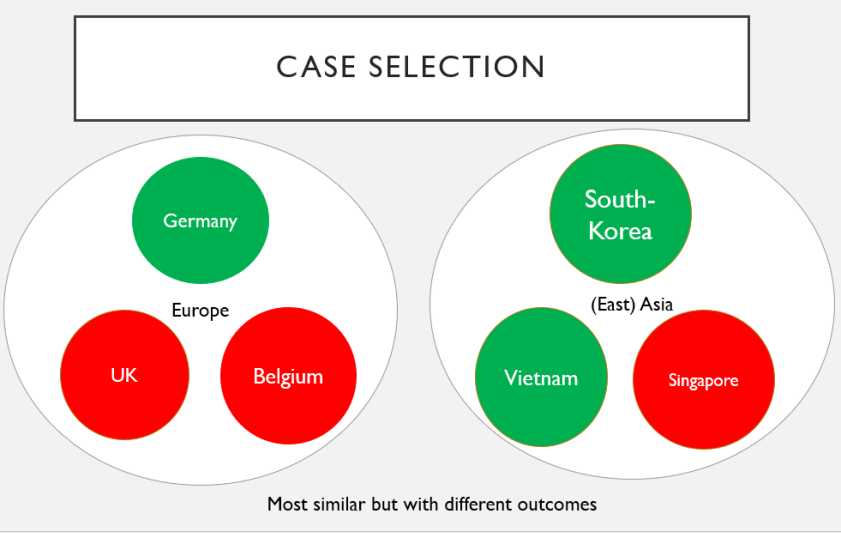


Figure 5: Case selection

Selection timeframe

This research will focus on the first wave of COVID-19, starting from the emergence/discovery of Corona on the first of January 2020. This selection is based on the data from Our World In Data (2020), which can be found together with argumentation in appendix 8.1.3.

3.2 DATA COLLECTION

The research question and the sub-questions are answered using a literature study and a document analysis. To start off, the document analysis, literature study and the used databases are elaborated upon.

Document analysis

The first research question is answered by a document analysis comparing the countries' individual National Pandemic Response Plans. Documents should be published after 2005 (revision of the IHR), when available in English or Dutch they can be analysed directly, if no English version is available indirect sources will be consulted. Complementary to the document analysis, a literature study will be performed to answer research question 2. the following search query is used in Google Scholar: (global OR international OR universal OR worldwide) AND (guideline* OR direction* OR strateg*) AND (Pandemic* OR Response OR Preparedness). By doing so, literature should be available that describes the technical and international guidelines concerning pandemic preparedness and response. The

literature should be based on one or more international guidelines (WHO, ECDC, CDC, PANAM) and be published after 2003 in English or Dutch. Additional grey literature will be explored derived from international health organizations (WHO, CDC, ECDC). These organizations provide guidelines and advice for creating National Pandemic Preparedness and Response Plans.

Literature study

A literature study is conducted to answer the fourth research question. The following search query will be used in the search engine Scopus and web of knowledge: (NAME COUNTRY) AND (COVID-19 OR SARS-COV-2 OR Coronavirus* OR SARS) AND (Response OR Disease Control OR outbreak management) AND (polic*) AND (government* respons*). The search engine Scopus is used to find peer-reviewed literature.

Table 4: literature

	Number of articles	
Country	Scopus	Web of Science
Germany	4	33
Belgium	3	16
UK	4	75
South Korea	9	40
Vietnam	1	8
Singapore	10	16

The literature should be published in 2020 and available in English or Dutch. This search query should result in additional, country-specific literature to gain insights into policy responses and context, complementing the data from the selected databases described in the next section. Due to the limited availability of relevant literature describing policy responses and possible explanations continuous snowballing has been used to collect more relevant sources. Especially the special issues 'policy and society, volume 39, issue 3 (2020)' proved itself useful for relevant literature and theories.

In order to answer the fourth research question, a combination of bottom-up and top-down approach is used. First, a bottom-up literature study was conducted to familiarize with the subject and to identify essential components of COVID-19 policy responses and possible explanations of COVID-19 performance and response. This resulted in a number of framework and theories. Components of the conceptual framework were to be used for a top-down analysis of country-specific literature. The top-down literature study included search terms that were associated with COVID-19 performance. These were: 'state capacity' OR 'Legislation' OR 'State capacity' OR 'capacity' 'organization*' OR 'learn*' OR 'SARS-CoV-1' OR 'SARS' OR 'strategy'. These search terms were entered in Scopus and Web of Science together with country names to single out relevant articles for this research; this also resulted in articles from 2021 because this literature study was conducted in a later stadium.

Databases

Various qualitative databases (Health system response monitor, OECD policy tracker, Cambridge core blogs) are used to answer the research questions that describe or explain policy responses of performance. These qualitative databases are complemented with a quantitative database: The Oxford COVID-19 Government Response Tracker (OxCGRT).

Health System Response Monitor

The COVID-19 Health System Response Monitor[1] is a publicly available online platform. It collects and organizes information on how health systems have responded to COVID-19 in Europe. Besides country-specific information, it provides a database of analysis (HSRM, 2021).

Cambridge core blogs

The archive within Cambridge Core Blogs[2] named: Country responses to the COVID-19 Pandemic contains reports of countries written by European Health Policy Group members and the *Anglo-American Health Policy Network*. They were invited to write 1,200 words on the response of their region or country thus far to the coronavirus pandemic. They were asked to dedicate the first 800 to a detailed description of their country/region's response to the Pandemic, indicating the justification given for the response. In the final part of the reports, they were asked to reflect on the response so far, considering what has been done well and what could be improved.

The Oxford COVID-19 Government Response Tracker (OxCGRT)

In addition to the qualitative database, a quantitative database is used that collects publicly available information on 17 indicators of government responses. It visualizes the stringency of governmental policy responses on various topics by providing scores between 1 and 100 overtime. OxCGRT gathers information on the indicators of government responses (Hale et al., 2021).

The OXCGRT is a tool that enables the comparison based upon several indicators which represent the implemented policies in countries. According to Gaskell et al. (2020) it enables researchers to analyze policy implementation and stringency over time. Four policy indices are available, each compromising of different indicators. Data is aggregated into a score between 0-100, measuring the number and strictness of the selected policies. In this case, the Containment and Health Index[3] is used, which builds upon the original government stringency index but is complemented with testing policies. The following metrics are used to generate the data: closures (including workplaces), restrictions on public events, gatherings and transport, stay-at-home requirements, risk communication, restrictions addressing internal movements, international travel control, face mask policies and the testing and vaccine policies. When policies are not consistent throughout regions or in the nation, the score of the strictest region is used. (Hale et al., 2021).

It should be noted that the results should be interpreted with caution since they merely give insights into the total score of the number and strictness of government policies. These results do not directly

[1] COVID-19 Health System Response Monitor (covid19healthsystem.org)
[2] https://www.cambridge.org/core/journals/health-economics-policy-and-law/hepl-blog-series-covid19-pandemic
[3] https://ourworldindata.org/grapher/covid-containment-and-health-index

give insights into the appropriateness or effectiveness of responses. A higher score is not inherently associated with being 'better' than those who score lower. Like any policy intervention, the effects of responses will likely rely on local political and social contexts (Hale et al., 2021). Therefore, literature is also analyzed, and this index is used as a complementary source in 4.2.5.

In the next section, the analysis is of the data is described.

3.3 ANALYSIS

This section will describe the methods used to analyse the data collected from the databases mentioned in the previous subparagraph. To start off, the document analysis is described, followed by the tools used to score and report on the similarities and differences between NPPRPs.

Document analysis

A tool derived from the study conducted by Droogers et al. (2019) guides the document analysis and answers research question 1. This tool will be used to score the countries' national Pandemic and response plans. This tool is complemented by an additional scoring list derived from the ECDC. Both are elaborated upon below before presenting the final scoring tool that is used in the next research question.

Scoring tool Droogers et al (2019)

This tool reviews the presence of crucial pandemic preparedness elements in the national plans of European countries. It provides a scoring list and contains a relatively large number of items which provide a clear and concise elaboration in the description that can be used to score points.
Altogether, 42 items were identified and merged into 14 categories. A question that addressed the topic was developed for each item (Appendix). The categories are grouped to represent pre-pandemic preparedness, response aspects and the recovery phase. Topics that are characteristic of influenza pandemic planning are included. The items were not weighted, meaning that all 42 items contributed equally(Droogers et al., 2019). NPI's and preparedness is the focus of this research. Therefore, the following themes and corresponding items are excluded: Vaccines, Antivirals & other essential medicines, Recovery and transition phase, and International interoperability. Included are: Preparedness planning, Strategic planning, Risk-based planning, Command control, coordination & monitoring, Risk communication, Early warning, risk assessment & surveillance, Health care system preparedness and response, Non-pharmaceutical public health interventions (NPIs), Essential services & business continuity, Special groups and settings.

To identify and score the national pandemic plans based on the descriptions and score sheet derived from Droogers et al. (2019) specific word search will be conducted on the individual national pandemic response plans (Appendix 7.1.2 table 5). In bold, the words are given that will be used as search terms. Underscored are the words that provide meaningful context on which the bold words should refer to/describe. Synonyms or abbreviations are checked for content if no hits are found using the words given in the description.

The scoring list contains many items and provides clear and concise elaborations in the description to score points. It clearly states what should be referred to, making it less prone to flaws or subjective interpretations. This tool is preferred above checklists which contain descriptions that leave more room for interpretation and therefore (preferably) require multiple researchers to score and compare individually.

The checklist is relatively short. The description of Non-Pharmaceutical Interventions (NPI), which contains two items, is short considering the reliance of NPI on preventing the spread of the disease. No distinction is made between several NPI's. The description mentions 'The plan refers to a policy describing the relevant NPIs". Therefore, an additional checklist will be added (appendix) derived from the ECDC (2017), which gives more depth to the section of NPI. It also contains no sections for remarks that are preferred and, therefore, added. This section increases transparency in scoring and allows for comments to be checked by other researchers.

ECDC Non-Pharmaceutical Interventions

No distinction is made between several NPI's in the scoring tool derived from Droogers et al. (2019). Therefore, an additional checklist will be added which complements the previous tool. This additional list is derived from the ECDC (2017), which gives more depth to the NPI section.
The scoring tool used in this research is shown can be found in Table 4.

A tool derived from the study conducted by Droogers et al. (2019) guides the document analysis and answers research question two, found in 4.1. This tool will be used to score the countries' national Pandemic and response plans. This tool is complemented by an additional scoring list derived from the ECDC. This results in a top-down approach to assess the National pandemic preparedness and response plans.

Scoring tool

In table 5 the scoring tool is provided which is used to guide the assessment of the NPPRP's in the next research question. Search terms are shown in bold the words, while the words that are underscored provide the context.

Table 5: scoring tool

Category	Item	Description
Preparedness planning	1 Simulation exercises	The plan refers to **simulation exercises**.
	2 National planning committee	The plan refers to a **national planning/preparedness committee**.
	3 Evaluation methodology	The plan includes a **methodology** to **evaluate** the pandemic mitigation measures
Strategic planning	4 Activation/de-escalation triggers	The plan refers to defined, country-specific **triggers** for activation and de-escalation of **mitigation measures**.
	5 Ethical aspects	The plan discusses and describes **ethical** aspects of mitigation measures
	6 Planning assumptions	The plan includes a range of realistic, country-specific **planning assumptions**
Risk-based planning	7 Risk assessment capacity	The plan refers to capacity and processes to perform national and subnational **risk assessments**
	8 National surveillance and monitoring	The plan refers to a **national surveillance system** to collect and analyze epidemiological and virological data (e.g., virology, risk groups, transmission, clinical severity, vaccination uptake, antiviral consumption).

	9 Differentiated response planning	The plan considers the possibility of **differentiated responses** depending on the situation severity.
Command control, coordination & monitoring	10 Crisis management system	The plan describes activation of **health sector** and **multisectoral crisis management systems**.
	11 Decision-making data requirements	The plan defines information **requirements** for **decision-making**.
	12 Technical advice for decision-making links	The plan describes the **crisis management** system links to technical and decision-making levels
Risk communication	13 Communications strategy	The plan describes the need for a **communication strategy** for the preparedness and response phases.
	14 Communication channels	The plan refers to strategies for targeting **pandemic communications** to different groups
	15 Cross-border communication coordination	The plan describes methods to coordinate **communication** with neighboring countries (e.g., the Early Warning and Response System of the European Union)
Early warning, risk assessment & surveillance	16 Investigation of first cases	The plan specifies the approach for **rapid investigation** of the **first indigenous cases**.
	17 Routine seasonal surveillance	The plan refers to the availability of sustainable, **routine** seasonal influenza **surveillance** that can be adapted to pandemic requirements.
	18 Surveillance feedback	The plan describes the processes to provide **feedback** to **surveillance** stakeholders and others
	19 Adaptable laboratory surveillance	The plan describes differential **laboratory testing** depending on the situation severity (e.g., decreasing testing as the pandemic evolves).
Health care system preparedness and response	26 Existing health care capacity awareness	The plan identifies the need for awareness of **health care capacities** at the time of activation.
	27 Surge capacity	The plan describes **surge capacity** for laboratory tests and patient care
	28 Health care information exchange	The plan proposes establishment of a **network** of clinicians, nurses, public health authorities, and health care authorities for frequent and rapid **information exchange**.
Nonpharmaceutical public health interventions (NPIs)	29 NPI policy	The plan refers to a policy describing the relevant **NPI**s.
	30 NPI communication strategy	The plan refers to a **strategy** to **communicate** NPIs to the public and other target groups
NPI addition ECDC	31 Evidence, international guidance and best practice	NPIs based on evidence, international guidance and best practice – all likely to be effective and feasible for the setting/country – are included in the pandemic plan. Their implementation and timing depend on the actual situation and severity in a pandemic.
	32 Public information	As a minimum, the public will be informed about the measures they can take to protect

		themselves and others from getting ill., i.e. by applying universal hygiene measures, such as frequent handwashing and cough etiquette. Such information is part of seasonal influenza campaigns and is re-emphasised in a pandemic.
	33 Travellers advice	Advice for **travellers** is given.
	34 Communication of measures	**Communicating** with those who will implement the measures and those that will be affected, e.g., parents and teachers, by school closures, and both the mechanisms and messages have been **tested**.
	35 The benefit–cost ratio and feasibility of NPIs	**The benefit–cost ratio and feasibility** of NPIs has been calculated and assessed in advance.
	36 Legal and ethical ramifications	**Legal and ethical** ramifications and effects of NPIs, risk mitigation strategies have been considered.
	37 The scientific evidence and socio-political considerations	The **scientific evidence** for the effects has been weighed against **socio-political considerations** and their negative impact.
	38 Triggers	Identifies **triggers** that determine when a particular measure will be **implemented** and **terminated.**
	39 Identification of the effects/effectiveness of NPIs	Mechanisms for **monitoring** the **effects/effectiveness** of NPIs have been identified.
	40 Off-the-shelf research protocols	**Off-the-shelf research protocols** with prior ethical and review board approvals implemented in order to study the effectiveness and response to non-pharmaceutical countermeasures.
Essential services & business continuity	51 Essential services identification	The plan identifies essential **public and private services.**
	52 Health business continuity	The plan requires the ministry of health, key public health agencies, and major health facilities to have **business continuity** plans.
	53 Vulnerable group support	The plan refers to identified methodologies to support **vulnerable groups** (e.g., at-risk patient groups).
Special groups and settings	35 Business and workplace preparedness	The plan refers to **preparedness/business continuity** for businesses and workplaces

	55 Vulnerable populations	The plan refers to specific actions for **migrants,** persons in **transit,** and **hard-to-reach** populations
	56 Third sector engagement	The plan describes roles for **third sector organizations: nongovernmental organizations, volunteer organizations, or community-based organizations** (e.g., Red Cross and aid organizations).

Summary table

To systemically report and compare the scores of the selected countries used to answer research question 2, a summary table will be made. In this way, the scores per country, including total scores, are available in one table. The scores are based on the assessment of the National Pandemic Preparedness and Response Plans by using the scoring tools mentioned above. Countries are scored individually of all items. The sores will be colour coded to visualize scores. Green will be used to indicate a higher score, while red indicates a relatively lower score. A separate section is included that contains the scores used in the research of Droogers et al. (2019), which enables the comparison of assessments. Scores of 1, 0.5 or 0 will be given in this research per item; each category consists out of multiple items. Table 6 provides an overview of the maximum scores per category.

Table 6: maximum category scores

Category	Maximum score
Preparedness planning	3
Strategic planning	3
Risk-based planning	3
Command control, coordination & monitoring	3
Risk communication	3
Early warning, risk assessment & surveillance	4
Health care system preparedness and response	3
Nonpharmaceutical public health interventions (NPIs) Droogers et al. (2019)	2
Addition NPI ECDC (2017)	10
Essential services & business continuity	3
Special groups and settings	3

3.4 VALIDITY AND RELIABILITY

Qualitative research draws upon a naturalistic approach that seeks to comprehend phenomena in a context-specific environment, unlike quantitative research, which aims to uncover causal determination, prediction, and generalization. Qualitative researchers aim to seek understanding and extrapolation to similar situations instead (Hoepfl, 1997). When performed correctly, a qualitative study can aid in understanding situations that otherwise could be perceived as puzzling or confusing (Eisner, 1991). Two terms widely used when referring to the quality of both qualitative and quantitative research are validity and reliability, which are elaborated upon below (Golafshani, 2003).

Reliability and validity

Many researchers hold different perspectives when it comes to the definition of reliability and validity. Validity is referred to when assessing the means of measurement and measuring what it is intended to measure. Researchers argue that this term does not apply to qualitative research, and a wide range of alternative terms emerged, such as quality, rigour, and trustworthiness(Lincoln & Guba, 1985). While not unified in the terminology, qualitative researchers agree to the need for a qualifying measure for their research. (Golafshani, 2003). In the next section, these qualifying measures are put into the context of a QCA.

QCA

To fit the research question with the right research design, a QCA is chosen. When the rights design is coupled with the right research questions credibility of the research is improved(Shenton, 2004). Credible research should consist out of high-quality data that should be carefully analyzed (Patton, 1999). QCA designs generally involve learning about facts we do not know by using the facts we do know, from which inference is established. The components of inferences and validity are shown in Figure 6. Establishing inference entails addressing three intertwined main components coherently. First, clarifying the question of external validity; second, establishing internal validity; and adopting a mode of reasoning (Thomann & Maggetti, 2017).

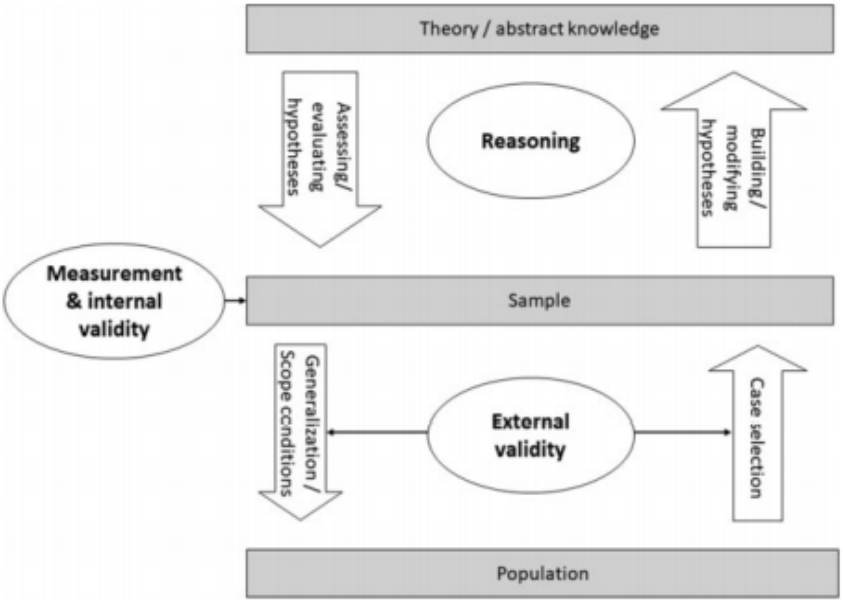


Figure 6:Components of inference (Thomann & Maggetti, 2017)

The QCA approach addresses these issues through a strong case orientation and specific case knowledge (Benoit Rihoux, 2013). By analyzing a small number of cases that allow for modest generalization, external validity is ensured, while the application of in-depth case knowledge ensures internal validity. This approach includes an inductive mode of reasoning (Thomann & Maggetti, 2017). In qualitative research, the results should be placed in the context from which the data is derived

(Shenton, 2004). In this research, the different groups are associated with different geographical characteristics and exposure to infectious diseases. Despite this, generalizable or transferable results to other regions or countries remain difficult and will prove challenging to obtain from single research. Therefore, considerable attention will be given to the selection of cases and the research agenda for further research.

Internal validity demands the minimization or absence of systematic bias from the analysis and the researcher. In this way, observations regarding descriptive and explanatory inference can be more valid. Case orientation and the approach which is taken in order to explain phenomenon's affects how internal validity is established.(Thomann & Maggetti, 2017). The case selection criteria's influences the extent to which extrapolation can be applied. The aim is to generate inferences that are as broadly applicable as possible, which typically involve maximizing generalization to the broader population (Thomann & Maggetti, 2017); in this research, countries with similar and different exposure to SARS-CoV-1 and geographical location.

QCA has multiple uses, and it can be applied both descriptive and explanatory (Thomann & Maggetti, 2017). The descriptive application entails compactly summarising data, referred to as the truth table (Berg-Schlosser, De Meur, Rihoux, & Ragin, 2009). The explanatory approach focuses on the causes of a given effect, which can be influenced by more aspects of complex causation. Both include summarising data, creating typologies, checking the coherence of subset relations, evaluating existing hypotheses, and developing new theories(Thomann & Maggetti, 2017). In this research, contradictory configurations are deliberately added, having shared characteristics but different outcomes. These contradictions can say something about the case that the researcher picked and motivative to seek solutions to these contradictions. Drawing random samples in qualitative research with a low N is an undesirable strategy. Therefore, cases are selected for the specific interest in their outcomes associated with the specific case; these are called 'positive cases'. The cases are selected to gain relevant in-depth knowledge, which helps with answering the research question(Mahoney & Goertz, 2006).

The inference components are closely interlinked, and trade-offs exist between the depth and accuracy of explanation, the internal validity, and the explanation's generalizability, the external validity.(Thomann & Maggetti, 2017).

4. Results

This section contains the results based on the conducted document analysis and literature study. First, the assessments and analysis of the NPPRPs are given in 4.1. This is followed by the description of the policy responses and possible explanations in 4.2. In 4.2.1, actual policy responses, strategies and response mechanisms, and potential explanatory factors are elaborated upon. In 4.2.2, the departure systems of countries are described, followed by the influence of SARS-CoV-1 exposure on COVID-19 response and preparedness in 4.2.3. Next, the quadruple loop learning theory is explored by example to gain insights into intra and interpandemic learning in 4.2.4. Lastly, trends of convergence and divergence are explored in 4.2.5 as possible indicators of cross-country policy learning.

4.1 ANALYSIS OF THE PLANS

This section is dedicated to the analysis of the National Pandemic Preparedness and Response Plans. A general description of the National Pandemic and response plans is given in the appendix. More detailed information on these guidelines and key area's are also provided in the appendix. The National Pandemic Preparedness and Response Plans are quantitatively analyzed using the scoring tool of Droogers et al. (2019) and the ECDC (2020), followed by a qualitative analysis providing more in-depth information. The analysis is given per theme. First, the quantitative analysis of the NPPRP is given per theme, providing within and between-group comparisons. This is followed by the most important findings of the qualitative analysis of the NPPRP's.

4.1.1 Assessment of the plans

In this section, the scores of the national plans of the selected countries will be discussed. Countries are scored using the tool from Droogers et al. (2019) and an additional tool that elaborated upon the NPIs based on the information of the ECDC. In the table, the scores are shown per country and category.

Table 7 shows the scores of each category for the selected countries. To ease comparison, the scores are color coded. The color coding is based on the relative score per row/category.

Table 7:: Theme scores of the selected countries NPPRP's

	Own assessment NPPRP's					Droogers et al. (2017) *
Category	**South Korea**	**Vietnam**	**Singapore**	**UK**	**Belgium**	**Germany**
Preparedness planning	2	3	1	1,5	2	3
Strategic planning	2	1	2	4	1	2
Risk-based planning	3	1	3	2,5	1,5	2
Command control, coordination & monitoring	1	0	3	1	2	3
Risk communication	2	3	0	3	3	3
Early warning, risk assessment & surveillance	4	4	3	2,5	4	3
Health care system preparedness and response	2,5	2,5	0	2	3	1
NPI	2	1	1	2	1,5	1
Addition NPI ECDC	4,5	0,5	3	6	1,5	
Essential services & business continuity	2,5	1	1	3	0,5	2
Special groups and settings	0,5	2	1	1	1	2
total	26	19	18	28,5	21	22

* The scores of Germany are derived from the research of Droogers et al. (2017) because there was no German pandemic plan available in English. Therefore, the scores for 'addition NPI ECDC' could not be attributed.

This results in an overview that shows different colors based on the relative score compared to the other countries in the same category. Green scores indicate relative higher category scores, whereas red scores indicate lower relative scores. Based on the most similar cases design, as described in 3.1, it would be expected that the total scores of South Koreas and Vietnam's NPPRP's would be higher than the score of Singapore's NPPRP, and the score of Germany's plan would be higher than the scores of Belgium's and the UK's. However, as shown in Table 7, this cannot entirely be confirmed. Although the score of South Korea is higher than Singapore's score, this does not hold for Vietnam's score. Germany's scores are slightly higher than Belgium's score. However, UK scores the highest. Below the category scores are elaborated upon both quantitively as well as noteworthy remarks resulting from the qualitative analysis of the plans.

4.1.1.1 *Preparedness planning*

Quantitative

Every country did mention a national planning committee in their plans, but only Vietnam's plan included a methodology to evaluate the pandemic mitigation measures.
There is no clear trend witnessed in the comparison of scores between European and Asian plans with regard to the items that belong to the category preparedness planning.

Qualitative

What stands out when reading the pandemic plans is that the Vietnam plan is written actively and includes concrete actions to be taken in the future to strengthen preparedness and capacity. The plan of Vietnam appears to be more of a living document, being revised and updated every four to five years.

4.1.1.2 *Strategic planning*

Quantitative

Only the UK and Germany included ethical aspects. The rest of the European and Asian countries did not include a section that elaborated upon the ethical aspects of mitigation measures.

Qualitative

What stands out from the qualitative analysis of the plans is that ethical aspects in the UK's pandemic plans hold an important position, emphasizing that mitigation measures can have a severe impact on society which should be minimized, and morale should be kept high. The other plans that were qualitatively assessed did not mention any ethical considerations.

4.1.1.3 *Risk-based planning*

Quantitative

Every country elaborated upon a national surveillance system to collect and analyze epidemiological and virological data. Vietnam's plan scores slightly lower on this category as a whole, while European countries scored lower on Risk assessment capacity.

Qualitative

When reading the plans, what stood out was the extensive elaboration upon the national surveillance and monitoring. However, in the plans of the UK and Belgium were mainly directed at Influenza A /H5N1 or the bird flu / H5N8 and did not mention SARS-CoV-1.

4.1.1.4 *Command control, coordination & monitoring*

Quantitative

European countries score slightly higher on the items related to command, control, coordination & monitoring, especially due to the low score of Vietnam. Both Singapore and Germany score maximum points.

Qualitative

In South Korea, The Ministry of Health and Welfare (MOWH) is supported by the Korean Center for Disease Control and Prevention (KCDC). The MOWH also describes relevant laws to emergency management. The Ministry of Health and Welfare (MOHW) is the primary agency. This agency describes relevant laws in national emergency management and healthcare and infectious diseases, such as communicable disease prevention and quarantine acts. The Influenza Pandemic Advisory Committee provides recommendations to the Minister of Health and Welfare. The Minister of Health and Welfare are in charge of primary decisions. -If the approval of the whole government is required, the Central Safety Management Committee will eventually make the decision (Korea Centers for Disease Control & Prevention, 2006).

Vietnam's national pandemic response plan is based upon a multi-sectoral approach, bringing the Ministry of Agriculture and Rural Development and Ministry of Health together. These ministries address planning, policy, surveillance and early warning systems, rapid response and containment, risk communication and service provision. At the provincial and lower levels, the People's Committees are given increased responsibility to coordinate communicable disease prevention and control. Steering committees at the provincial and lower levels unify health and non-health sectors to coordinate multi-sector preparedness and response, chaired by the People's Committees. They enhance the resilience of communities in times of pandemics, recognized as an essential factor of effective whole-of-society preparedness (Vietnam Ministry of Agriculture and Rural Development and Ministry of Health, 2011).

Singapore elaborates upon The Homefront Crisis Management System (HCMS), which is considered the national framework responsible for enabling a 'whole-of-government planning and response" during crises like a pandemic. It is led by a Homefront Crisis Ministerial Committee (HCMC) and chaired by the Minister for Home Affairs, who gives strategic and political guidance during a crisis. The HCMS is assisted by the Homefront Crisis Executive Group (HCEG), which is chaired by the Permanent Secretary for Home Affairs. The task of the HCEG is to provide a transparent and integrated multi-agency system to prepare for crises and prepare contingency plans to respond to (peacetime) emergencies appropriately. This group is assisted by various Crisis Management Groups (CMG), who target the operational issues. The minister of Health chairs the CMG (Ministry of Health

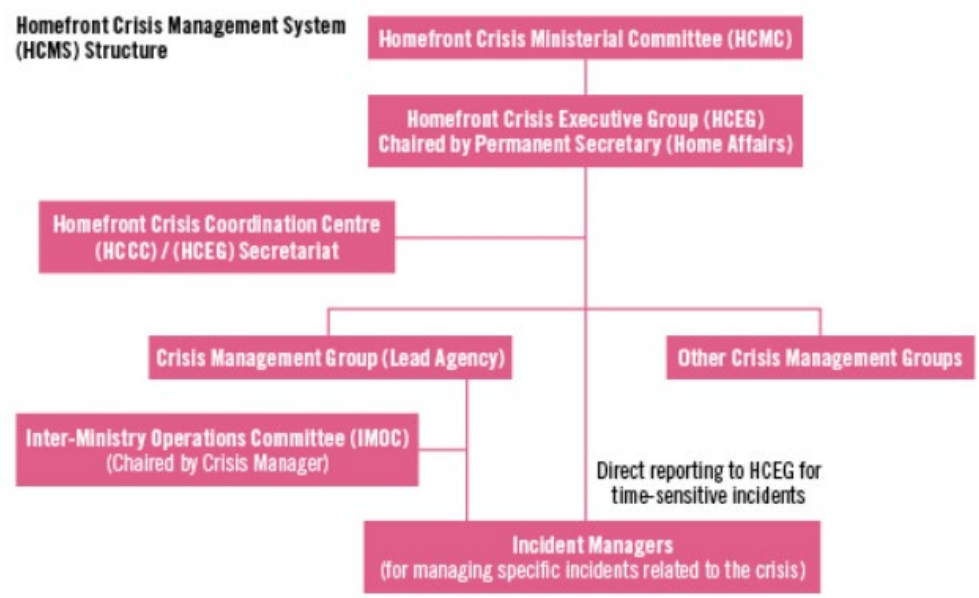


Figure 7: Homefront Crisis Management System (Ministry of Health Singapore, 2014)

The pandemic response plan of Singapore focuses on the DORSOM (Disease Outbreak Response System Condition) framework, which differentiates levels of severity and spread accompanied with advice on specific measures to be taken. Clearly defined phases consider the level of transmission and the severity to create a proper risk assessment. Preventive measures are provided per phase, mainly aimed at hospital settings. It states that 'All suspect and confirmed cases will be isolated, as far as operationally feasible. When the number of cases exceeds isolation capacity, cases will be cohorted.'. Furthermore, it states that "any timely initial assessment of an emerging disease would be based on incomplete and limited information; hence the measures taken would err on the side of caution with more intense efforts until such time when the disease profile becomes clearer.' (Ministry of Health Singapore, 2014).

Although Vietnam does not elaborate on a specific crisis management system, it does mention its decentralized structure in provincial levels are authorized to make its own strategies; however, when 'the potential severity of social and economic costs of a human pandemic or serious emerging disease event point to the need for centralized decision-making
In certain situations. Special measures would be justified in an emergency context to assist the provinces to mobilize and access financial resources and to take responsibility for the implementation of their local preparedness strategies within an overall national response'. The plan of Singapore elaborated specifically on its The Homefront Crisis Management System (HCMS), While South Korea emphasizes the prominent role of the KCDC. The UK elaborates upon the 'The National Security Council (NSC)', comprising ministers from across central government departments. During a pandemic, the NSC will be in charge of central government activities, make key strategic decisions and determine priorities.

4.1.1.5 *Risk communication*

Quantitative

Risk communication is lacking in the pandemic plan of Singapore, while the European countries score maximum points. The scores for risk communication in the Asian plans are lower.

Qualitative

Although the scores of the Asian plans are lower in this category, it did provide a more elaborate strategy for communications. South Korea does not score maximum points on the risk communication, but it did have a clear and concise communication strategy, describing how to communicate and why it should be done consistently and transparent. While European plans did score high on risk communication, specific strategies and motivation is not as elaborate as South Korea. Furthermore, the communication strategy of Singapore follows the DORSCON framework phases, with each phase having its own pre-established advices for the public. However, it does not take into account how to communicate and how to reach 'hard to reach' populations.
The pandemic plan of Vietnam was focused on behavioural change via public health measures and utilizing effective communication strategies and clear messages. Also, lessons learned from previous pandemics and the challenges of effective response are elaborated upon in detaill.

4.1.1.6 *Early warning, risk assessment & surveillance*

Quantitative

All countries scored high on Early warning, risk assessment & surveillance, therefore not notable differences can be reported upon.

Qualitative

Only South Korea mentions the large volume of testing that can be expected during the pandemic, stating that private parties can be considered for RT-PCR testing. Furthermore, no noteworthy aspects regarding the early warning, risk assessment & surveillance were witnessed.

4.1.1.7 *Health care system preparedness and planning*

Quantitative

Especially Singapore scored low on Health care system preparedness and planning, the rest of the countries were comparable with scores. No noteworthy qualitative data has been identified to report.

Qualitative

South Korea provided estimations of hospitalizations and (expected) capacity during a pandemic, how cases should be triaged when needed. Expect for South Korea, relative limited information is provided on estimated health-care capacity and how to improve it during a pandemic or interpandemic periods.

4.1.1.8 *NPI and Addition NPI ECDC*

Quantitative

All countries scored low on the NPI items in their pandemic plans. In general, describing few details, scientific evidence or ethical considerations. Mostly lacking are mechanisms for monitoring and off

the shelf research protocols to study the effectiveness. The UK scored the highest compared to the other countries, but no clear difference could be witnessed between the scores of Asian and European plans.

Qualitative

The considerations of suitable NPIs discussed in the UK's pandemic plan were backed with scientific evidence and references. Where the other plans lacked scientific evidence, the UK provided evidence that favoured against a variety of measures for the public, such as facemasks, restrictions on gatherings and limiting international travel. Sentences like 'Although there is a perception that the wearing of facemasks by the public in the community and household setting may be beneficial, there is in fact very little evidence of widespread benefit from their use in this setting. 'and "There is very limited evidence that restrictions on mass gatherings will have any significant effect on influenza virus transmission" are characteristic for the discourse throughout the document. The document also refers to travel restrictions in the same manner; 'there is no evidence of any public health benefit to be gained from meeting planes from affected countries or similar pro-active measures.' In its ethical framework, it holds proportionality and flexibility high in regard. It only will impose restrictions when it is considered as 'absolutely necessary to protect the health of the public and then only for so long as it is appropriate.' Furthermore, it aims to "encourage appropriate behaviour without causing panic or appearing disproportionate. ". Furthermore, the plan includes lessons learned from previous events, frequently referring back to the avian flu (DH Pandemic Influenza Preparedness Team, 2011).

4.1.1.9 *Essential services & business continuity*

Quantitative

In general, all plans in this category scored low due to the absence of vulnerable group support. However, only Belgium did not mention health business continuity plans.

Qualitative

What stands out is that the item 'Vulnerable group support' is scored upon, but generally, plans only take into account vulnerable groups with medical conditions or so 'high-risk' groups. There is no mentioning of vulnerable groups in terms of those with Low social-economic status, or for instance, migrant workers.

4.1.1.10 *Special groups and settings*

Quantitative

All countries scored low on special groups and settings. All countries referred to business continuity plans. However, only Germany mentioned specific actions to support vulnerable populations and only Vietnam mentioned third sector engagement such as non-governmental organizations and community-based organizations. No significant differences in the category score are witnessed between Asian plans and European plans.

Qualitative

No noteworthy remarks were identified during the qualitative analysis.

4.1.2 Summary

The within-group comparison of the Asian plans reveals that South Korea scored the highest out of the three countries in total (26), followed by Vietnam and Singapore (19). Besides Vietnam scoring lower on strategic planning and command control and coordination, the quantitative analysis did not reveal striking differences in category scores. The qualitative analysis revealed that South Korea is the only country that mentioned private parties regarding testing. Vietnam's plan differed from the other plans, being more focussed on and elaborating on the action of the past five years, what should be included in future plans and what actions should be taken. Singapore's plan clearly focussed on the pre-established crisis management system and its own pandemic response framework, the DORSCON framework.

Out of the European plans, the UK scored the highest overall (31), followed by Belgium (22,5). The score of Germany is somewhat incomparable with these previous scores, but based on the assessment of Droogers et al. (2019), it would rank the lowest out of the three countries. Especially Belgium scored low on the category 'special groups and settings', while the UK scored the highest on NPI's. Only Germany included vulnerable populations in its plan. Qualitative analysis revealed that the content of the UK's plan on NPI included scientific advice against certain NPI's regarding restrictions for public gatherings, international travel and face masks.

A difference that is witnessed between the Asian and European scores is that the total scores of the European plans were higher, except for South Korea's scoring higher than Belgium and Germany. European countries also scored higher on risk communication, and the Asian plans did not mention ethical aspects. Similarities that stood out was the relatively high score of all plans on the category 'Early warning, risk assessment & surveillance' and the low scores on the categories regarding NPI's and 'special groups and settings'. A visual representation is presented in Figure 8 on the next page.

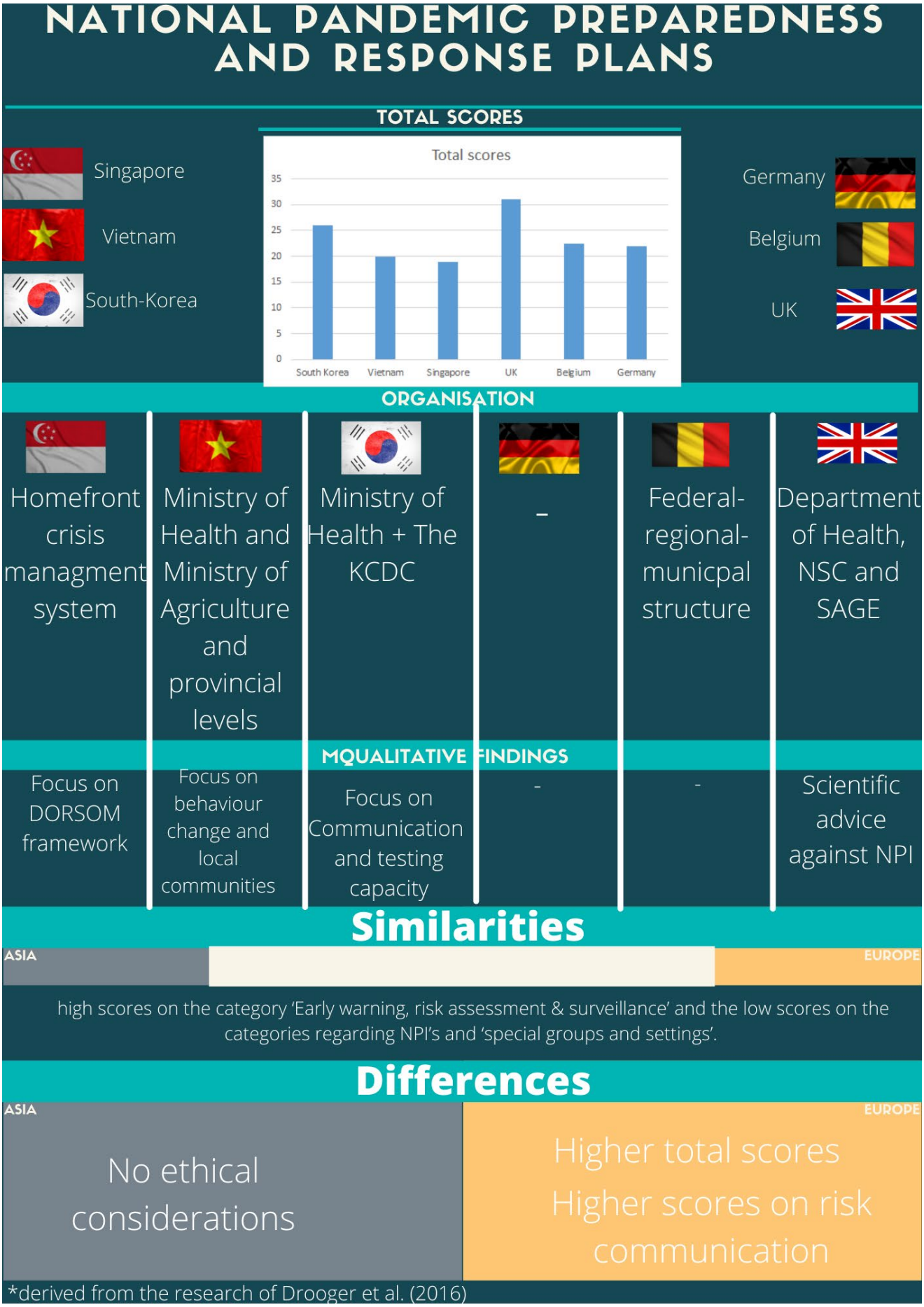


Figure 8: NPPRP comparison

4.2 COVID-19 POLICY RESPONSES

In the following section, the response of individual countries is described. First, a short introduction of the country will be given, containing general information, followed by an elaboration on "the Basis of the system". This is followed by information on policies and strategies, and lastly, a description of the response mechanism will be given.

4.2.1 COVID-19 response: policies, strategies and response mechanism

In the following section, the response of individual countries is described based on the content of the available literature and databases. First, a brief overview of strategies is provided, shown below. Policies, strategies and the response mechanism are described for the European countries, followed by the Asian countries, based on the framework of He et al. (2021). This section focuses on the outputs; thus, organizational structures and legislation will be elaborated upon in the next chapter, which shifts the focus to explanatory factors of COVID-19 policy responses and outcomes.

4.2.1.1 *UK, Belgium and Germany*

In this section, the implemented policies, strategies and response mechanisms are described of the UK, Belgium and Germany.

Policies and Strategies

In Germany, measures that imposed limitations on public life were imposed relatively early. These subsequently resulted in a rather moderate increase of COVID-19 cases and sufficient healthcare system preparedness to deal with these cases (Carroll et al., 2020). According to Dostal (2020), German policies resembled the primary response throughout the EU. Policies included implementing lockdowns, social distancing, expanding hospital capacity, and providing subsidies to help those affected by the previous policies. As the incidence rose halfway through March, many countries in the EU resorted to lockdown policies. The authors point out that the application of these policies indicate that Germany learned from other countries, mentioning policy diffusion as an indicator. Länder adopted similar policies while the national government aided in coordinating and supporting these policies. There has been minimal disagreement or public dissent. (Rozell & Wilcox, 2020).

The policies implemented in Belgium increased as prevalence rose, eventually leading to a complete lockdown on the 17th of March. These policies included the closing of non-essential business and restrictions regarding travelling. This lockdown was implemented only five days after the announcements from the government, stating that a lockdown, as implemented in Italy, was not envisioned as a measure in suppressing COVID-19 numbers. The influences of several regional authorities contributed to this change of strategy (Desson, Weller, McMeekin, & Ammi, 2020).

Eventually, the UK was forced to adopt a wide variety of measures and policies such as a lockdown, social distancing and closing non-essential business due to increased death and infection rates (A. Boin et al., 2020). Measures and policies that corresponded with the WHO recommendations were also implemented in early March 2020 (Miralles et al.) According to Gaskell et al. (2020), the UK lacked the ability to design policies to fit different locations and considering demographics and cultures. Problems were experienced with early tracking of the virus, resulting from limited testing capacity and expansion of this capacity was done in a centralized way by establishing four mega laboratories (Gaskell, Stoker, Jennings, & Devine, 2020).

The presence of a properly functioning system to identify and isolate (potential) COVID-19 cases is important. The components of finding, testing, tracing, isolation and supporting (FTIS) of COVID-19 cases is considered to be essential in COVID-19 responses. The underlying theory is not complex: those with symptoms are tested, when positive, their contacts are traced and isolation is recommended or enforced. However, FTIS do require a supportive (complex) system and fast and effective communication between various organizations or governmental bodies (Rajan, Cylus, & McKee, 2020). As described above, this was not a given in all countries and the degree to which coordination problems occurred varied.

Germany and the United Kingdom produced some of the earliest COVID-19 tests after Asia. However, large scale testing is only possible if laboratories are fully equipped with the needed resources, procurement and distribution systems. This proved to be challenging even for Germany who faced the pandemic with a well-developed diagnostics and chemicals industry, which eventually contributed to rapid large-scale testing. This diagnostic capacity was not present to that extent in the UK (Rajan et al., 2020) and when faced with insufficient laboratory capacity, three types of actions can be witnessed: 1) expanding existing medical laboratories or repurposing others (in Germany, 300 local laboratories were accredited), 2) creating large centralized laboratories (UK) or 3) outsourcing the analysis of samples to other countries (Rajan et al., 2020). The UK opted for a more centralized approach, creating several huge laboratories leading to a highly centralized system. This creation was outsourced to companies with little or no experience running laboratories (Rajan et al., 2020). the UK faced particular challenges in distributing tests to high-risk settings, including care homes. The vast majority of testing took place in a small number of laboratories resulting in transportation bottlenecks and issues in the supply chain. (Rajan et al., 2020). Yoo et al. (2020) pose that the UK's initial lack of focus on testing and increasing volume resulted from a capacity problem.

According to Lu et al. (2021) many countries in the world applied mitigation strategies using non-pharmaceutical interventions (NPI), combined with testing, tracking and tracing of cases, followed by repeated lockdowns. The authors mention that Germany applied a mitigation strategy, but also implemented a thorough testing strategy (Lu et al., 2021), indicating that it leaned more towards containment strategy than other European countries. According to the authors, the German approach resembled, to a certain extent, the South Koreas approach regarding its testing, tracing and isolation strategy (Dostal, 2020).

The UK opted for the controversial strategy of "herd immunity". Later on, it was forced, due to increased death and infection rates, to adjust its strategy and adopt a wide variety of measures such as lockdowns, social distancing and closing non-essential business (A. Boin et al., 2020) and switched strategy at the 16th of March when healthcare capacity was threatened(Gaskell et al., 2020). What could explain the choice of strategy was the conception among SAGE members, which revolved around the belief that altering people's behaviours would not be achievable at a large scale to reduce the spread of the virus and therefore shying away from "early high-intervention policies". This strategy was relied upon until early March (O'Donnell & Begg, 2020). Boin et al. (2020) also conclude that the advisory structure was present but fell short, pointing out that it was 'abused by the political executive' and reluctant to learn from other countries. Furthermore, the lack of diversity is mentioned as well, as he quotes: "If independent public health experts had not been excluded from

the core committee, which is dominated by modelers, virologists, clinical academics and .behavioural scientists, the influenza-driven 'herd immunity' strategy might not have materialized"(A. Boin et al., 2020).

Only five days after the announcements from the Belgium government, stating that a lockdown as implemented in Italy was not considered an option to suppress COVID-19 numbers, it imposed a lockdown on the 17th of March. According to the literature, the influences of several regional authorities contributed to a change of strategy (Desson et al., 2020). According to He et al. (2020), Belgium and other European countries underestimated the potential of COVID-19 during the onset. In Belgium, this led to a lack of quarantine measures in the early phase and insufficient supplies, resulting in severely affected long term care facilities (He et al., 2020).

Response mechanism

As described before, TTIS systems are essential components of effective pandemic response. However, it does demand properly functioning procurement and distribution systems, which proved difficult for many countries, even Germany (Rajan et al., 2020). Shortages of resources and supplies were mentioned to be problems during the first wave. In Belgium, a significant number of COVID-19 deaths resulted from cases that occurred in long term care facilities. Nursing homes were seriously affected due to a shortage of resources and equipment to protect against COVID-19. The required resources depended on the availability of local resources, which fell short when the public demand rose. This meant that although general recommendations were provided by the government, the implementation of these recommendations proved to be difficult (Miralles et al.).

According to O'Donnel & Begg (2020), the UK took on the battle against COVID-19 with a relatively weak evidence base, arguing that (epidemiological) data was not used properly or by the right institutions. The lack of correct government structures and processes hindered the process of translating information into effective decisions.

In Belgium, the presence of a minority government, the complex structure and fragmented area's with scattered responsibilities led to problems regarding effective decision making and unclear communication regarding measures. However, communications COVID-19 cases was efficient (Schokkaert & Luyten, 2020).

4.2.1.2 *Vietnam, South Korea and Singapore*

In this section, the implemented policies, strategies and response mechanisms are described in the South Korea, Vietnam and Singapore.

Policies and strategies

In general, Vietnam, Singapore and South Korea applied similar sets of policies and measures in the early stages, but with different focus areas. A more preventive approach could be taken (Vietnam) or a strategy aimed at extensive testing regimes (South Korea), while Singapore applied policies based on SOP's derived from previous experiences early on. More detailed descriptions of policies are presented below.

Chua et al. (2020) identify three general sets of measures and policies in Singapore's battle against COVID-19. The first one being directed at the prevention of imported cases. Secondly, a clear emphasis was given to the detection and isolation of cases in an early stadium. Finally, emphasis was given to social responsibility to slow transmission, including information on hygiene measures and

limiting physical contact (Chua et al., 2020). Singapore implemented effective control measures similar to those used in many other Asian countries. Furthermore, Laboratory testing capacity was gradually increased and included both public and private facilities. Contact tracing and isolation facilities were in place for those with positive COVID-19 tests. Strict measures like were present to effectively trace and isolate, such as quarantine and phone surveillance (Chua et al., 2020). According to Chua et al. (2020), measures and policies that were implemented corresponded mainly to those used in previous experiences. Following the successful early response, problems occurred between March and April concerning the local transmission of COVID-19 and its management. What followed were cases that could not be traced, and secondary local transmission occurred within communities (Abdullah & Kim, 2020). From April to the beginning of May, the incidence of COVID-19 within local communities and foreign workers rose quickly. The response that followed consisted of isolation and mass testing, increasing surveillance and introducing the 'circuit breaker'. This circuit breaker was initiated on the third of April and was extended to the first of June (Abdullah & Kim, 2020). An & Tang (2020) point out that a policy focus neglecting certain societal groups may severely affect how a country can defend itself against COVID-19, despite early success and there are two main lessons to be learned when looking at the policy response of Singapore 1) surges of cases occurred when more stringent policies were lifted, despite being effective at the time and supported by the public and 2) the disproportionate divide of COVID-19 cases amongst society as social inequity and underlying conditions almost certainly led to an uneven distribution of cases amongst marginalized groups and immigrants.

The primary purpose of South Korea's infectious disease management was aimed at prevention and preparedness. It focused on three components: openness, transparency, and democracy (You, 2020). South- Korea has put significant efforts into contact tracing. Tests were free of charge, foreigners and undocumented migrant workers were also covered to ensure that the containment strategy covered reached the whole population (Park , Kim , Schnitzler , & Kim, 2020). Testing capacity has been relatively high due to established public-private partnerships, and the combination with extensive epidemiological investigations led to effective contact tracing (You, 2020). According to Oh (2021), the effective '3 T model' (test, trace and treat) enabled South Korea to prevent total lockdowns or travel bans, while public awareness and compliance increased the effectiveness of social distancing and self-quarantine policies. (Kim, 2020). The Korean government took thorough measures to trace contacts, using data surveillance technology to derive information such as transactions and locations via phones (Kim, 2020). Oh (2021) point out that many South Koreans hold public health and person high in regard, and these methods were backed by society.

Vietnam already acted during the period before the confirmation of the first case. The policy response aimed to assess the threat, develop guidelines and plans, and impose preventive measures. Long before any indigenous case, the Ministry of Health issued a directive on the 3rd of January regarding quarantine measures due to a shared border with China (La et al., 2020). When the first case was identified, policies aimed to minimize the spread via inbound travellers and containment. This strategy was realized by using emergency responses, preventive actions, travel restrictions and applying a form of market control to ensure resource availability. Strict screening and isolation measures were imposed on those arriving from China, eventually restricting several flights to high-risk areas (La et al., 2020). As soon as the domestic transmission was identified at the beginning of February, the government implement more strict measures such as: 'quarantine, isolation of suspected virus carriers and voluntary isolation at the community", and a local lockdown of 20 days

was implemented to prevent spillover from a commune in the north. Localized lockdowns were part of Vietnam's strategy as ‘a lockdown can be applied anywhere with a detected outbreak’(La et al., 2020). What followed were more severe measures such as; ‘obligated 14-day quarantine at centralized facilities’ and the ‘’temporary suspension of entry to all foreigners on March 22’. (La et al., 2020). A unique measure was taken on the first of April, a “15-day nationwide social distancing” was announced. This measure included that everyone in the country would go into self-isolation, complemented by denying both international and national travelling (La et al., 2020). According to Lu et al. (2021), Singapore, Vietnam and Singapore, all applied containment strategies, including .behaviour change interventions, testing, tracking and tracing. More detailed information on these strategies and their implementation is presented below.

Linh et al. (2020) point out that the political context of Vietnam facilitated rapid decision making and the implementation of policies and measures. The strategy of ‘localizing and quarantining’ was applied to both individuals as residential areas or even entire organizations (Dinh & Ho, 2020). This strategy was also described by Tung (2021), who emphasized that the response of Vietnam was characterized by relatively severe and early measures aimed at isolation, monitoring and tracking. A lesson that has been derived from its previous experience with SARS in 2003. Although considered a relatively strict response in the early phase of the pandemic, this approach eventually made efficient use of resources (Tung, 2021). Linh et al. (2020) point out that the response strategy of Vietnam is regarded as one of the cost-effective approaches. The applied strategies appear to be based on previous outbreak prevention experiences instead of scientific evidence, which was relatively absent with regard to NPI’s. Rapid decision making, culture and previous experiences have enabled these efforts into a successful response to COVID-19 (Linh et al., 2020). The strategy and measures were considered ‘above and beyond the recommendations of WHO’, especially in the early stages. However, the general agreement amongst epidemiologists in Vietnam was that these measures were “extreme but sensible” (Linh et al., 2020).

The foundation of South Korea’s response was built upon a thorough testing strategy, isolation measures and enhanced surveillance, resulting in a low level of mortality (Cambridge core blogs). South Korea became one of the first countries to effectively ‘flatten the curve’, despite being densely populated and geographical position. Worthy of mentioning is the ability to do so without imposing an aggressive lockdown. It adopted a strategy that is abbreviated as TRUST; this consists out of the words: “transparency, robust, screening and quarantine, unique but universally applicable testing, strict control and treatment’ (Oh, 2021)

All countries implemented a comparable strategy aimed at containment. However, a different focus is witnessed between Vietnam and South Korea. Vietnam implemented a strategy of early prevention and early stringent measures (Linh et al., 2020), and South Korea used their (partly pre-established) capacity to apply a strategy that included large testing volumes and extensive tracing (Oh, 2021; Park & Chung, 2021; You, 2020). No specific literature was found that elaborated upon specific areas of Singapore’s strategy.

Response mechanism

Components of the response mechanism that hindered or facilitated COVID-19 policy responses are elaborated upon below. Not all aspects of the response mechanism are described due to the limited availability of literature.

Singapore's swift initial response and strategy were built upon pre-established fiscal, analytical, political and operational capacities. These capacities were strongly influenced, in a positive manner, by its previous experience with SARS in 2003. While Singapore focuses on outsourcing and privatizing public services due to optimization and efficiency, it left room for such 'excess capacity' due to its previous experiences. Such operational capacity and technological and human capital proved to be essential for detection, isolation, and treatment (Woo, 2020). Singapore's government implemented strict control measures top-down, consistent with its history and socio-political culture (Abdullah & Kim, 2020). However, the sudden rise of cases in Singapore indicates that, despite the rapid response and pre-established capacities, underlying problems were present (Woo et al. 2020) and insufficient coordination or internal communication between the Ministry of Health and the Ministry of Manpower combined with the absence of adequate preventive policy actions led to the unexpected surge of COVID-19 amongst foreign workers (Woo, 2020).

Korea received international attention in February when it activated the first drive-through screening centres, which enabled large volumes of tests to be performed. This collaboration with private parties, combined with isolation and contact tracing, was an essential part of its strategy (Kim, 2020). According to Oh (2021), the testing kit and drive-through system, both public-private partnership products, have been praised worldwide for their effectiveness. South Korea's ability to rapidly test and trace has been an essential component in its response and was enabled by public-private partnerships, enabling increased capacity and efficiency.

In terms of risk communication, the media in Vietnam effectively raised people's awareness through propaganda and communication messages (Dinh & Ho, 2020). Vietnam emphasized the importance of their communication strategy to increase trust and compliance, putting restrictions on travelling and tourism early on, despite being a country that is heavily dependent on tourism(Linh et al., 2020). The media in Vietnam is subject to political control and protected by pre-established law, which allows for selective filtering of information. Risk communication was based on 'short and clear slogans' intended to align with the chosen policies and reflect the situation (Tung, 2021). According to Linh et al. (2020), risk communication, clear leadership, supportive culture and rapid decision making were essential components in Vietnam's response, preventing an overload of its limited resources.

When analysing the actual responses of countries, comparing between and within groups, several similarities and differences are observed. To start, European countries applied similar sets of measures and a mitigation strategy. However, Germany was able to apply a better functioning FTIS system. Second, Asian countries also applied similar sets of measures but used a containment strategy. Within this group, it stands out that Vietnam focussed even more on early prevention, while South Korea appeared to be more focussed on applying finding, tracing, isolating and supporting COVID-19 cases. Singapore also applied extensive measures early on, being similar to those implemented in Vietnam and South Korea. This raises the question why similar policies and strategies led to different outcomes in Europe and why Asian countries applied a different strategy with more distinct focus area's. To explain the observed differences and similarities between countries, the initial departure system is explored in 4.2.2, followed by the possible influence SARS-CoV-1 had on actual preparedness in 4.2.3. Furthermore, the possible influence of inter and interpandemic learning is explored by example in

4.2.4. At last, trends of convergence and divergence are explored as a possible indicator of cross-country policy learning in 4.2.5.

4.2.2 COVID-19 response: Initial departure system

The following paragraphs will elaborate on the initial departure systems as presented in the conceptual framework in 2.3.4. This includes organizational structure, legislation and state capacity. First, the departures systems of the European countries are described, followed by an elaboration on the systems of the Asian countries selected in this research.

UK, Belgium and Germany

Organizational structure

The first group to be discussed consists out of countries that are categorized as federal. This trait influences public health policy and politics (S. Greer, H. Jarman, S. Rozenblum, & M. Wismar, 2020). There are many benefits to federalism and decentralization. It leaves room for actions to compensate for unconstructive behaviour by the central government. However, policymaking in a decentralized country is more challenging, demanding proper coordination. Coordination challenges can arise as regions or parties can have varying priories and beliefs. A crisis, such as COVID-19, can also lead to challenges regarding decision making and autonomy of regions (S. Greer et al., 2020)

Federalism can also be seen as a beneficial feature due to its policy diversity, adapting to local circumstances and facilitating learning and experimentation (S. Greer et al., 2020). While most governments have centralized internally, such as setting up task forces, this is somewhat more complex when addressing federations. Cooperation and coordination between governments, centralized to the central government, or regional diversity can be pursued. These three categories can subsequently occur in various combinations and can be differentiated in policy areas(S. Greer et al., 2020). The authors distinguish three approaches 1) voluntary cooperation: the identification and solving of shared problems is handled among the regions themselves or with assistance or control of the central state, 2) the state can centralize powers and functions due to urgent functional motives and 3) regional diversity and autonomy are continued, allowing local implementation and decision-making, leading to a variety of responses (S. Greer et al., 2020).

According to (S. L. Greer, H. Jarman, S. Rozenblum, & M. Wismar, 2020) the UK, Belgium and Germany moved to a form of power centralization regarding governance. Belgium combined this with voluntary coordination. Germany also centralized the acquisition of PPE, but distribution was left to the regions. It engaged in voluntary coordination concerning testing and tracing and the planning of health services. Furthermore, Germany left the Länder with a degree of regional autonomy with regard to physical distancing during the transition phase. Belgium took care of the physical infrastructure via voluntary coordination and left regions autonomous concerning physical distancing, testing & contact tracing and when it came to paying for the services of nursing homes and people with disabilities.

According to Jones & Hameiri (2021), the poor performance of relatively wealthy countries have been attributed to the COVID-19 pandemic as being unprecedented or unexpected. However, they pose that this argument does not hold since the WHO has put significant efforts and attention into the preparation of pandemics, especially since the emergence of SARS-CoV-1 in 2003. They pose that explanations on poor performance can be found that the shift from ‘government’ to’ governance’

and the emergence of the regulatory state. This shift hollowed out ‘effective state capacities’, diffused responsibilities and resulted in ‘de facto reliance on ad hoc emergency measures to contain crises’. The authors portray the example of the UK, in contrast to South Korea. Whereas in the UK, regulatory governance resulted in a poor performance during the first wave of COVID-19, as it is not designed to combat societal challenges like pandemics. The shift from government to governance led to: ‘the deliberate reduction of popular expectations of public authority; the outsourcing of responsibility to technocratic, private and quasi-autonomous actors, weakening lines of control and accountability; and the hollowing-out of state capacities. The failure of existing regulatory measures in the UK is posed to lead up to the Coronavirus Act on the 25th of March, putting in place ‘government by decree’, abandoning existing frameworks resulting in policymaking without preparations (Jones & Hameiri, 2021).

Legislation

Besides the organizational aspects that led to coordination problems, (pre-existing) laws or plans dictate the extent to which a government can act. The extent to which countries drew upon emergency laws, (pre-existing) plans or declared the state of emergency also varied (S. L. Greer, H. Jarman, et al., 2020)

Whereas Belgium did not create new emergency laws, the UK and Germany did. The UK passed a law leading to a rearrangement of government decision-making within its government. In Germany, the 'Act for Protecting the Public (Health)’ temporarily stretched powers related to the provision of pharmaceutical and medical devices (S. L. Greer, H. Jarman, et al., 2020).

According to He et al. (2020), Belgium ‘established a relatively perfect legislation system which defined the structures, roles, and responsibilities of governments and other actors.’ Furthermore, it released a series of royal or ministerial decrees which provided legal support for controlling the spread of viruses.’

State capacity

When describing the initial departure system, in this specific case of the UK, it is noteworthy that the shift of 'government’ to ‘governance’ and a regulatory state weaken state capacities. As described by Jones & Hameiri (2021), this reduced state capacity especially took its toll on public health capacities and infectious disease preparedness. Operational responsibility shifted to local government while budgets were cut. (Jones & Hameiri, 2021)

4.2.2.1 *Vietnam, South Korea and Singapore*

Organizational structure

Jones & Hameiri (2021) pose that it is not authoritarian states that performed well but authoritative states. This nuance lies in the ability to rally people and resources as a result of well-built political and institutional bonds with the societies they govern, as well as the retention of essential state capacities.

Vietnam used the entire political system during its response, including the government, the Communist Party and various social organizations. Furthermore, A steering committee was created and tasked with decision making at the highest level (Dinh & Ho, 2020). The Ministry of health and the national committee conducted a rapid assessment of the country’s (healthcare) capacity before being hit by COVID-19 by analyzing five different scenarios, differing in the number of anticipated

cases. This analysis revealed the possibility of several shortages of resources and generated awareness, possibly shaping future response strategies (Linh et al., 2020). Its state management system was composed of four levels: 'centre (TW), province/city, district and commune'. These levels were vertically integrated using a top-down approach, a structure that, according to the authors, proved efficient in addressing COVID-19(Dinh & Ho, 2020). Furthermore, there was a centralized structure in place(Sharma, Borah, & Moses, 2021).

The focus of Singapore's preparedness was realized by a "whole-of-nation" approach, drawing upon lessons from SARS-CoV-1. This approach led to efforts throughout the country that targeted institutions, individuals and the preparation of outbreak management plans. During the response, centralized efforts were derived from a task force represented by multiple ministries (Chua et al., 2020). The early and valued response was mainly due to the know-how already present in the political environment, resulting in a quick and adequate response. The basis of the response was derived from the DORSCON framework, which, as mentioned in the previous chapter, was a significant component of the national pandemic response plan (Chua et al., 2020).

South Korea is a democratic unitary political system accompanied by a centralized public health system. Its agencies can respond and implement measures quickly, also at local levels. Such a structure implicates that local governments possess limited autonomy (You, 2020). However, research of Oh (2021) mentions that an increase in autonomy was given to local authorities. COVID-19 response in South Korea is described by Kang, Kwon and Kim (2020) as a whole-of-society approach, including efficient communication between ministries, central and local governments. A centralized and resilient healthcare system enabled the efficient implementation of measures for COVID-19. According to Greer et al. *(2020),* the public health agency of South Korea was firmly in the lead. On February the 23rd, the president of South Korea gave both local and central governments directions to implement appropriate measures. The central-local collaboration proved its value, and the KCDC gave local authorities more autonomy to implement what it deemed necessary(Oh, 2021). As a result of flexible coordination, differentiated regional measures and strategies were implemented, resulting in rapid testing and decreased incidence. Besides the added value of central-local government cooperation, local governments aided each other by sharing resources and distributing resources (Oh, 2021).

Legislation

South Korea revised and created laws that might be needed when encountering future epidemics or pandemics. This was done as a reaction to SARS in 2003, MERS in 2015 and Influenza H1N1 in 2009. According to Park & Chung (2021), institutional changes and legal amendments were realized before COVID-19 and shortly after its emergence. The institutional changes played an essential role in increasing testing volume and capacity during its initial response. The mobilization of local resources, which enabled the test and trace strategy in South Korea, was enabled by legislations that were forged during and in interpandemic periods. The Medical Devices Act, created in June 2016, permitted the government to authorize the use of unapproved in-vitro diagnostic test kits in an emergency when no approved diagnostic tests are available. Furthermore, ex-post approval and local initiatives led to the creation of drive and walk-through test stations, which contributed to the testing capacity and efficiency (Oh, 2021). Testing capacity and efficiency were also mentioned in the work of Kim (2020), who emphasized the increased production capacity and technology of diagnostic

kits due to prior exposure to infectious diseases. No specific literature was found attributing specific legislations to the success or failure of policy responses for Singapore and Vietnam.

State capacity

According to Jones & Hameiri (2021), the best performing countries during the first wave of COVID-19 were those with fewer regulatory states features such as fragmentation and privatization; amongst them are South Korea and Singapore. They pose that this resulted in central agencies retaining considerable infrastructural power and the capacity to gather needed resources when needed the most. Experiences with SARS-CoV-1 highlighted the 'pitfalls of a diffuse approach to pandemic management', which resulted in the buildup of national capacities enabling effective COVID-19 control. The KCDC was trusted with the management of infectious diseases and granted autonomous power over budgeting, staffing and resource deployment.

4.2.2.2 *Summary*

Although federalism was linked with coordination problems, no evidence was provided that federalism itself was linked to COVID-19 performance. As for regime type, there was no literature available at the time to indicate that there is causation witnessed between regime types and COVID-19 performance, but regime types were mentioned to have effects on state capacities. In the case of South Korea it is posed that its regime type affected its state capacity. According to Mao (2021), South Korea possessed strong information capacity due to its democratic features, which facilitated a timely response. A combination of centralized public health and central-local government relations, providing local governments with a degree of autonomy, resulted in better information capacity, decision-making capacity and implementation capacity. Having a weaker coercive capacity compared to the authoritarian regime, it imposed less restrictive measures and acted through a 'state-society synergy' by cooperating and including the private sector in preparations and response. The authors suggest that democracies have stronger information capacities that can aid timely response, but on the other hand, it would be more difficult to contain the spread once it becomes worse due to weaker coercive capacity. This could explain difficulties experienced by the UK and Belgium in the effectiveness of their policy responses.

Pre-existing social conditions combined with late recognition of disease transmissions in migrant workers led to a significant rise in cases in Singapore (B. Y. An & S.-Y. Tang, 2020; Chua et al., 2020). According to An & Tang (2020), the example of Singapore shows that proper facilitation and implementation of measures directed to marginalized or vulnerable groups are essential to adequate planning and response. The surge and problematics associated with this rise in cases are, according to Woo et al. (2020), a consequence of inadequate analytical capacities, underestimating the threat that the living conditions posed to rising infection rates. Eventually, this also led to a rising demand regarding operational capacities, as the healthcare system was put under severe pressure (Woo, 2020).

Analysis shows that centralization or de- centralization does not have a single predictive outcome. For example, the UK and Belgium encountered coordination problems hindering their response (Rajan et al., 2020; Schokkaert & Luyten, 2020), but Belgium had a less centralized approach than the UK. According to Sharma, Borah, & Moses (2021), both centralized and decentralized governance structures influence the way governments respond to pandemics.

The departure system (organizational structures, legislation and state capacities) could influence resources availability in countries. Jones & Hameiri (2021) provide the example of the UK, where the shift from government to governance and the rise of a regulatory state had significant impacts on state capacity, hindering successful COVID-19 preparedness and responses, in contrast to South Korea, which retained capacities as a result of less regulatory features and measures taken based on its experience with previous epidemics.

According to Wieler, Rexroth, & Gottschalk (2020), Germany's relative success compared to European countries was partly due to well-developed diagnostic capacities, strong healthcare capacities and early efforts. Raoofi et al. (2021) designate its relative success to a quicker response, including containment measures, testing and quarantine. This quick response was also mentioned to contribute to the success of South Korea. According to Yan, Chen, Wu, Zhang, & Zhu (2021), initial policy-making in countries is influenced by cultural and institutional factors; in Germany and South Korea strong state implementation capacity and cultural factors supported more strict and timely responses.

This chapter emphasizes that preparedness and the ability to respond is, according to the literature, influenced by the departure system in which organizational structure, legislation, and state capacities can influence each other and effective COVID-19 response.

4.2.3 Context: experience (exposure to SARS2003)

Park & Chung (2021) highlight that South Korea's previous experiences and failures with SARS-CoV-1 in 2003 and MERS in 2015 have built the foundation for the recent success during COVID-19. In the aftermath of MERS, policy recommendations were used to reshape operations while increasing the autonomy of health professionals. They state that South Korea took the opportunity to learn from past experiences, resulting in an institutional transformation, having an advantage over those who were not exposed to previous epidemics. However, the authors also state that the policy feedback theory on its own does not guarantee favourable results in the future. They argue that Public-Private-Partnerships and 'leapfrogging' are the essential additional components to fully understand South Korea's success during the first wave of COVID-19 (Park & Chung, 2021). Leapfrogging is the process in which those regarded as the 'the late-comer can move significantly faster in development than the 'forerunners' or establish a new path. Due to these processes and legislation, large investments can be avoided, enabling companies to rapidly catch up with the advanced players (K. Lee & Lim, 2001). The combination of private actors who developed test kits and emergency-use-authorisation enabled large-scale testing, which was an essential part of South Korea's success (Park & Chung, 2021).

According to Oh (2021), prior exposure to epidemics in South Korea facilitated organizational learning, resulting in institutionalization and legalization, which built the foundation for 'agile governance'. This agility was achieved by an 'iterative and interactive learning process'. These processes led to both centralization and adaptations regarding crisis management. This agility and adaptive capacity were facilitated by a 'flexible organizational structure, collaborative participation of stakeholders, strategic resource management, and an efficient decision-making process'. The KCDC functioned as the "national command centre', as quoted by the author. The established system allowed a certain degree of depoliticizing, as scientific experts took the main lead handling the pandemic response efforts since January (Oh, 2021).

The strategy, state capacity and resources are translated into the initial governmental policy response, influenced and shaped by experience and (initial) departure system. Countries might have been prepared by previous epidemics, shaping the initial response in Vietnam, South Korea and Singapore. However, the characteristics of the disease might not be the same as before and require adaptations of the response until the 'problem' is solved. These changes might lead to variations in context, such as different vulnerable populations or more prolonged exposure to the problem.

Singapore was attributed to high capacities and resources (Woo, 2020) it did not translate into better outcomes compared to Vietnam and South Korea; while the UK ramped up production of tests and laboratories, it still faced several challenges and bottlenecks which prevented the desired outcome(Rajan et al., 2020). As Greer et al. (2020) state: 'Having strong state capacity does not mean it will be used well'. They were indicating that the way one organizes and coordinates its capacity is essential as well. In that sense, merely increasing the activity, such as testing volume, does not ensure the desired effect.

COVID-19 can be seen as a wicked problem as multiple problems compete and conflict with each other(Cohen & Cromwell, 2020). As stated by An & Tang (2020, 'policy impacts on wicked problem-solving is a function of the interactions between culture and policy instrument choices, constrained by institutional infrastructure and capacity'. However, the degree to which governments can adapt to changing circumstances or what lessons it has drawn from previous experiences seem to matter, either by establishing supportive legislation, increasing capacities and infrastructure and opting for suitable strategies and initial policy responses.

4.2.4 loops of policy learning

The purpose of the following chapters is to explore possible explanations for different COVID-19 policy responses and outcomes based on the literature study. The ability to apply rapid implementation of containment and prevention policies also draws upon a certain degree of flexibility within its governance. Adaptive capacity and learning in this context entail how governments of different countries could address and adjust to complex societal issues, a wide range of stakeholders with different interests and uncertainty of the effectiveness of responses. Adaptive capacity is vital when dealing with significant, disruptive changes that come with pandemics such as COVID-19 (Janssen & van der Voort, 2020). To shape effective responses, four learning loops are presented. These loops take into account how time, target, context, assumptions and actions influence results and how learning and reflection during responses can influence results. It is worth emphasizing that these are explorations based on the literature available by the time of writing, and no causation or generalization is suggested. The application of the conceptual model in this chapter is not a systematic analysis. However, it is explored by example and supported by literature that elaborated on specific countries and outcomes.

The example of South Korea is used to describe successful quadruple loop learning.

Single loop

The Korean government's response to COVID-19 was based on the learning outcomes from previous experiences, and during the response single-loop learning consisting out of modifications of and improvements in the existing response system (Seulki Lee, Yeo, & Na, 2020).

Double loop

However, underlying assumptions and strategies were challenged as larger outbreaks occurred, demanding new actions to be taken. Previous assumptions that were drawn upon were reconsidered and changed, indicating double-loop learning. The authors provide the example of the implementation of social distancing and mandatory facial mask-wearing (Seulki Lee et al., 2020).

Triple loop

The context influenced the actions taken during the response and influenced the initial departure system. Based on lessons learned from previous pandemics, the Korean government shifted from fragmented responses to the re-centralization of authority by putting the KCDC firmly in the lead and by building up essential state capacities.

Before COVID-19 struck, multiple arrangements and legislations secured the capacities needed for infectious disease response and enabling tracing methods. As a result, the initial large-scale outbreaks of COVID-19 in early 2020 were contained without resorting to *ad hoc* emergency measures (Jones & Hameiri, 2021). Previous established and secured state (Jones & Hameiri, 2021) and diagnostic/testing capacity due to previously establish legislations and PPP's most likely enabled its initial strategy and response being heavily based on TTIS systems(Oh, 2021; Park & Chung, 2021).

Quadruple Loop

According to Lee et al. (2020), the Korean government changed its assumptions and actions as the external environment changes to produce the best results. Adaptive policy-making in quadruple-loop learning includes both detecting changes in external environments (context, time and target), activating a relevant internal response system, and finding adaptive solutions to solve problems at each stage. This included policy decisions and related actions such as the complete testing for high-risk population, and adjusting the degree of NPIs as the number of confirmed cases changes. These four learning loops are continuously drawn upon until the pandemic fades away.

This also indicates that insights into the translation of insights in context, target and time, require adaptive policy-making to prevent surges of cases. Below examples are given that emphasizes the need for quadruple loop learning in other countries and how adaptations might have been too late.

When addressing the context and target of a disease, it is important to identify the pathogenicity and characteristics to address it adequately. It is essential to consider how these characteristics translate to both micro-level interaction patterns for disease transmission and meso-structures of disease transmission (Van Gunten, 2021). Whereas micro-level interactions take into account how the disease spread between individuals, the meso-structure elaborates on the pattern of disease spread at a higher level, including clusters corresponding to organizations, locale, and events. This meso-structure is vital to include and adapt to accordingly because pre-existing social networks can play an important role in transmitting diseases. Social, cultural, and policy aspects of the social settings are

likely to influence the spread of the disease through meso-structures, as was the case in Singapore, where the pre-existing social networks and conditions of migrant workers highly influenced the disease dynamics (Van Gunten, 2021). Meso-structures could also entail how long-term care facilities are affected and via which patterns. Identifying which meso-structures are relevant and which (potentially) contribute to disease transmission can lead to more effective, adequate and timely policies and public health interventions. This identification would require quadruple loop learning since this would require learning, adapting or anticipating problems and implementing solutions to counter the emerging problem (S. Lee et al., 2020).

According to Ang & Tang (2020), marginalized groups or vulnerable populations are essential to be included in policymaking to prevent surges of cases (B. Y. An & S. Y. Tang, 2020). An insight which would require adaptive policy-making and continuous learning, or in this research referred to as quadruple loop learning. For example, in Singapore, this led to the rapid increase of COVID-19 cases (Chua et al., 2020), and both Belgium and the UK suffered from high incidence and mortality in long-term care facilities(He et al., 2020; Miralles et al.; Miralles et al.; Mitchell et al.). Singapore's present and excess capacity did not prevent the increase in COVID-19 cases in the long term due to surges in migrant worker populations (Woo, 2020). This indicates that capacity and resources are only adequate if they reach and facilitate those who need it, in which quadruple loop learning plays an important role. In the research of S. L. Greer, E. J. King et al. (2020) it is stated that: ‘a country’s response to a public health crisis is only as good as its response to its least privileged populations.’

4.2.5 Convergence or divergence (Containment and Health Index)

This chapter will address the selected countries' actual responses by analyzing policy stringency and timing. The Oxford Stringency Index will be analyzed to uncover patterns of the severity and timing of government responses. Furthermore, this chapter will contain country-specific literature derived from the databases Scopus, Web of Knowledge, Cambridge core blogs and HSRM to describe policy responses in detail, putting the quantative data into context.

Policy stringency and timing

This section will discuss the data from the Oxford Covid-19 Government Response Tracker (OxCGRT) using the Containment and Health Index. Two Figures are presented, which are divided into representing the two groups of selected countries. The first group consists of the European countries (UK, Germany and Belgium) the second group are the countries in the Asian region, which had more severe exposure to SARS-CoV-1. A higher score means that more or stricter policies have been implemented, higher scores are referred to as a more ‘stringent’ responses. The Containment and Health Index provides a visual representation of policy stringency and timing which can be used to compare (groups of) countries.

UK, Belgium and Germany

The Containment and Health index for the UK, Germany and Belgium is shown on the next page (Figure 9).

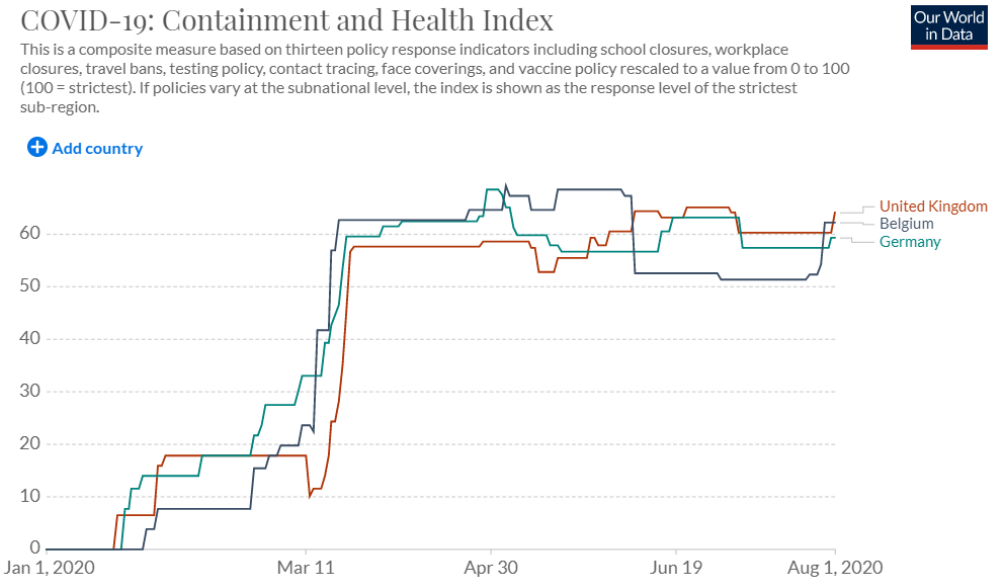


Figure 9: Containment and Health index, UK, Belgium and Germany (Hale et al., 2021)

A steep increase in the UK's score is witnessed since the 11th of March, indicating that eventually, a set of multiple and severe measures were implemented. It had the lowest score until half of June but eventually rises over time and surpasses Germany and Belgium. Compared to the UK and Germany, Belgium increases in score relatively slow and eventually showing a steep increase since the beginning of March and showing fluctuations from the 1st of June onwards. It resembles Germany's response until the end of April, albeit with a 'lower 'score, indicating that measures were less strict. Compared to the UK and Belgium, Germany shows a more incremental increase. Since the highest peak in June, Germany shows the slightest fluctuations, implying a more gradual approach to relieving mitigation measures. This is in line with the findings of Gaskell et al. (2020), whom also analyzed the response of the UK. They concluded that the UK was the latest in applying severe restrictions that impacted social and economic life compared to fifteen west-European countries (including Belgium and Germany). Furthermore, the authors point out that, despite the higher numbers of cases and deaths, the UK started easing restrictions around the same time other European countries did. These findings are in line with the Figure presented below, which shows that the UK had the slowest and least stringent policy response until early June compared to Belgium and Germany.

According to Dostal (2020), German policies resembled the primary response throughout the EU. Policies included implementing lockdowns, social distancing, expanding hospital capacity, and providing subsidies to help those affected by the previous policies. The authors point out that the application of these policies indicate that Germany learned from other countries. Nevertheless, the authors state that this was done somewhat indirectly via policy diffusion. As the incidence rose halfway through March, many countries in the EU resorted to lockdown policies, as implemented in China. This is also shown in Figure 18, which shows a steep increase in stringency in Germany, Belgium and the UK.

When analyzing the response of these three European countries the assumption was made that they had less severe exposure to SARS-CoV-1, or would be impacted less. The lack of prior exposure and

experience may have may explain a delayed initial response, eventually transforming into a rapid increase of policy stringency around March, likely due to the rapid surge of COVID-19 cases, increased mortality or awareness of capacity and disease characteristics. However, although the countries show a relatively similar pattern of timing and stringency of policies, it does stand out that the UK was the last one to rapidly imply measures after an initial period of a stable level of stringency and even a dip. It seems that inexperience and the timing and implementation of policies is influenced by other factors as well. This might be where capacity, leadership and decision-making processes come into play.

Singapore, South Korea and Vietnam

Figure 10 visualizes the scores of Singapore, Vietnam and South Korea.

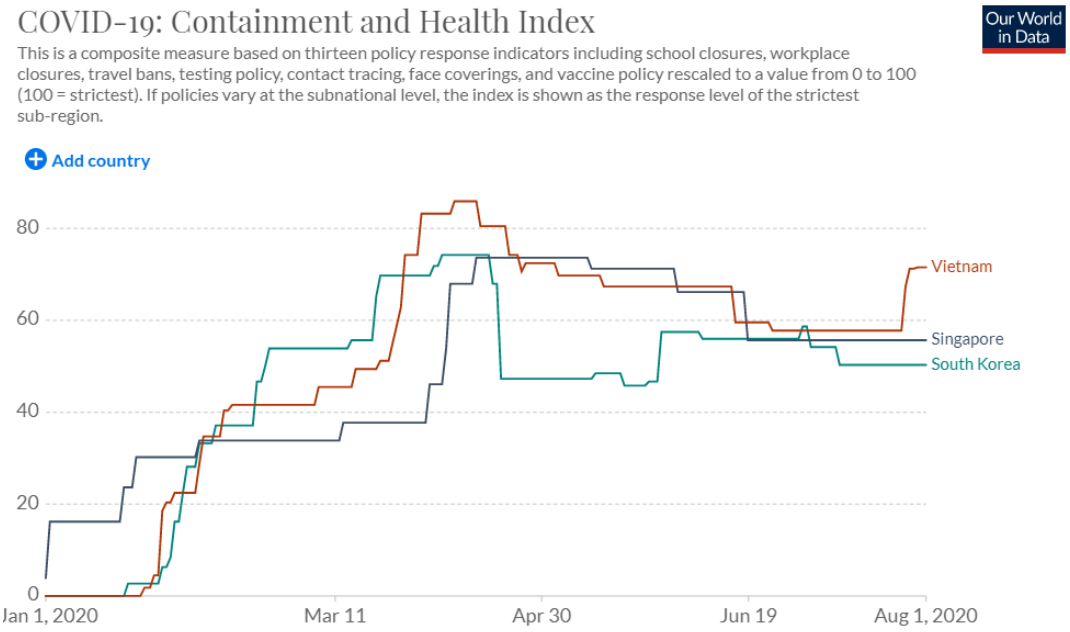


Figure 10: containment and health index Vietnam, Singapore and South Korea

When analyzing the literature and the data from the containment and health index, three observations are made.

The first one is the quick and stringent approach; all three countries applied measures early on. The second observation is that the more incremental increase. Lastly, although the countries applied similar measure early on, they are seemed to have a somewhat unique response, presumably differing in strategy, policy choices and stringency. This indicates that that in these cases there is less convergence compared to the European countries. This especially hold for South Korea which diverges into a lower stringency compared to Vietnam and Singapore around April. Whereas Vietnam diverges to higher levels of policy stringency from March to the end of April.

This group was selected based on their prior exposure and experience with SARS-CoV-1. An explanation for the rapid and tailored response could be the prior exposure to SARS-CoV-1, shaping initial response. An explanation could be that pre-estabilshed infrastructure, capacities, political commitment or public support could have led to more stringent initial responses as a part of the (initial) strategy.

Comparing both groups

When comparing the response of both groups, what stands out is the homogenous policy response in European countries as a result of rapid policy diffusion around mid-march. The stringency of response and timing were more similar in European countries. However, did not lead to similar results. Vietnam, Singapore and South Korea responded early, but 'less' similar in terms of stringency and timing. The scores in Asian countries increased more rapidly in the beginning, with scores around 40 on the 11th of March, eventually reaching scores of 75 in late April. These scores decreased to scores between 55-60 in June. However large differences in scores are witnessed between the three Asian countries. The scores of the European countries rapidly increased in March to scores between 55-65, slowly decreasing afterwards to scores of around 50.

Compared to the Asian countries, Germany, Belgium and the UK appear to show a response that is more similar in terms of policy stringency and the timing of implementation. The policy response and shows a pattern of convergence, with the stringency and timing becoming more similar as time passes. (2021) pose that in the first phase of COVID-19 national strategies were based on nation state perspectives, without 'systematically mobilizing trans-European, cross-border coordination and collaboration'. Countries decided independently on their mitigations strategies without using horizontal learning mechanisms (between counties). Subsequently, the rapid convergence trend, noticeable in the beginning of march, was triggered copying basic containment measures resulting in rapid policy diffusion absent of 'learning, knowledge sharing and evidence-based policy transfer'

Vietnam, South- Korea and Singapore appear to show a more unique or tailored response, differing more in terms of policy stringency and the timing of implementation. Furthermore the response appears to follow a more divergent pattern, showing some divergence over time in terms of stringency and the timing of implementation. The difference between the policy stringency and timing of European and Asian countries could indicate that prior exposure could translated into more unique and tailored responses due to previous learned lessons or changes in supportive systems.

The policy stringency score of Singapore increases the fastest initially, which is in line with the literature, indicating a rapid response to the implementation of measures in an early stage. This initial response stabilizes in score until a rapid rise occurs in the first half of April. Singapore's score seems to corresponds with the measures taken in the form of the 'circuit breaker', eventually reaching the same 'level' of strictness as South Korea. However, South Korea decreased the measures in late April. This decrease would resemble the strategy of applying mitigation measures, extensive testing and tracing while avoiding strict lockdowns. The score of Vietnam rapidly increases and reaches the highest score. This data corresponds the strategy described in the literature, which points out that severe measure was taken rapidly to prevent issues related to its relatively low healthcare capacity. Government policy responses in Europe were similar following a mitigation strategy, with less stringent measures earlier on which became more stringent as cases increased. Vietnam, Singapore and South Korea responded swiftly by implementing a containment strategy, implementing more stringent measures earlier on while European countries implemented mitigations strategies following a more reactive approach and implemented stringent measures in a short period of time when cases rose rapidly.

4.2.6 Summary

This research question was aimed at exploring the differences within both groups of countries. Numerous explanations can (partly) explain the observed differences. In this section, the most

evident ones that followed from this research were elaborated upon. A visual summary is shown in Figure 12.

Policies, strategies and response mechanism

measures and policies have been relatively similar in all countries, differences exist between initial strategy, regional differentiation, timing and stringency. Whereas Germany, Vietnam and South Korea implemented regional differentiation, followed by either a form of centralized decision-making or resulting from regional autonomy. In short, policy responses including NPIs and TTIS have been essential in successful responses. Vietnam, South Korea and Germany all drew upon NPI's and TTIS systems to reduce or prevent COVID-19 spread (S. L. Greer, E. J. King, et al., 2020). However, effective TTIS systems and NPI's rely on a variety of factors to lead to desired results and need supportive systems and the availability of state capacities. As indicated by the examples above, it matters how and if vulnerable populations are included in policies, how (state) capacities are used, when they are used and whom they reach. In Singapore, Vietnam and South Korea a more rapid response was witnessed implementing a containment strategy, previous experiences left South Korea and Singapore with more resources and Vietnam with awareness on it capacity limits.

Initial departure system

The departure system is referred to as the starting point. It entails the organizational structure, legislation and policies that enable the implementation of measures. This departure system differs per country and is influenced by social and historical contexts. It is a starting point, but it is not static and is subject to changes as the situation changes or prolongs. Differences are present in structures, the degree of centralization or decentralization, pre-existing policies, legislation and state capacities. It is posed by Jones & Hameiri that the shift from government to governance and regulatory states negatively influenced state capacities and pandemic preparedness and responses in the UK. South Korea was equipped essential state capacities as a result of lessons learned from previous epidemics. Central agencies retained considerable infrastructural power and the capacity to gather needed resources when needed the most, backed by previously established legislation and PPP, resulting in efficient COVID-19 response.

Experience to SARS-CoV-1

Literature points out that (state) capacities increased in the countries with more exposure to SARS-CoV-1, especially in the cases Singapore and South Korea. Vietnam appeared to be well aware of its limited capacities opting for a strategy with a focus on early prevention. This indicates that the exposure to SARS-CoV-1could have fueled the rapid and effective response due to learning and increased preparedness resulting from changes in capacities, legislation and organizational structures.

Learning loops

The first learning loop consisted of SOPs and initial measures which were fueled by previous experiences. South Korea applied measures early on based on knowledge of SARS-CoV-1 and MERS. generated by the KCDC. The second learning loop included the reassessment of assumptions and implementing for example social distancing and face mask policies as a result of feedback on previous actions and results. The third learning loop included interpandemic learning processes between SARS-CoV-1, MERS and COVID-19. These lead to alterations in organizational structures, legislations and state capacities. Finally, adaptive responses and pandemic learning fueled by time, target and context continued, resembling the quadruple loop learning which led to its successful response over time.

Convergence and divergence

When analyzing the Containment and Health index, a convergence trend can be witnessed in the response of the European countries in this study, while a more convergent trend it apparent between the Asian countries. The rapid convergence in European countries around March is likely due to rapid policy diffusion and less likely to be fueled by learning processes and knowledge sharing. A visual summary is shown in Figure 11 below.

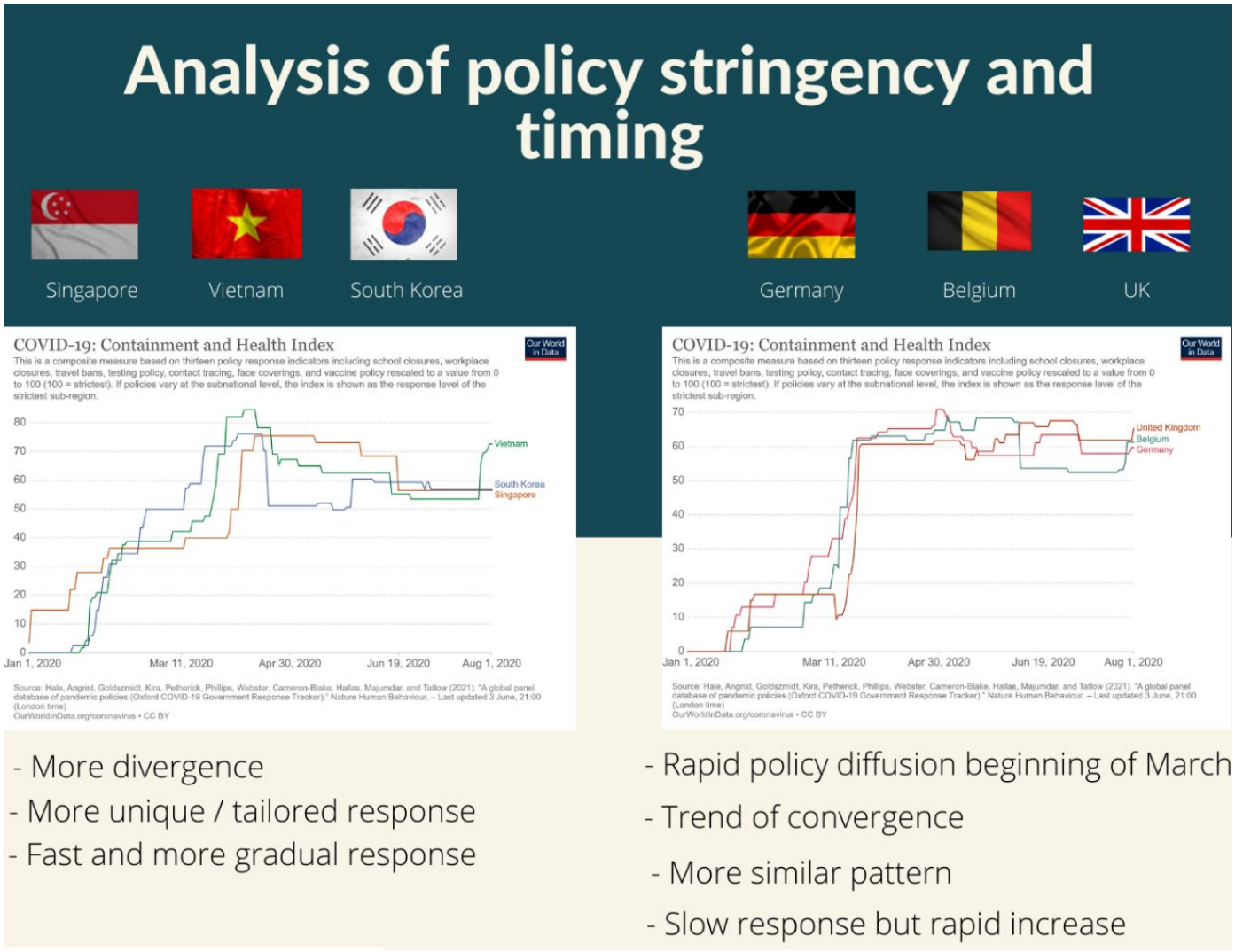


Figure 11: stringency and timing

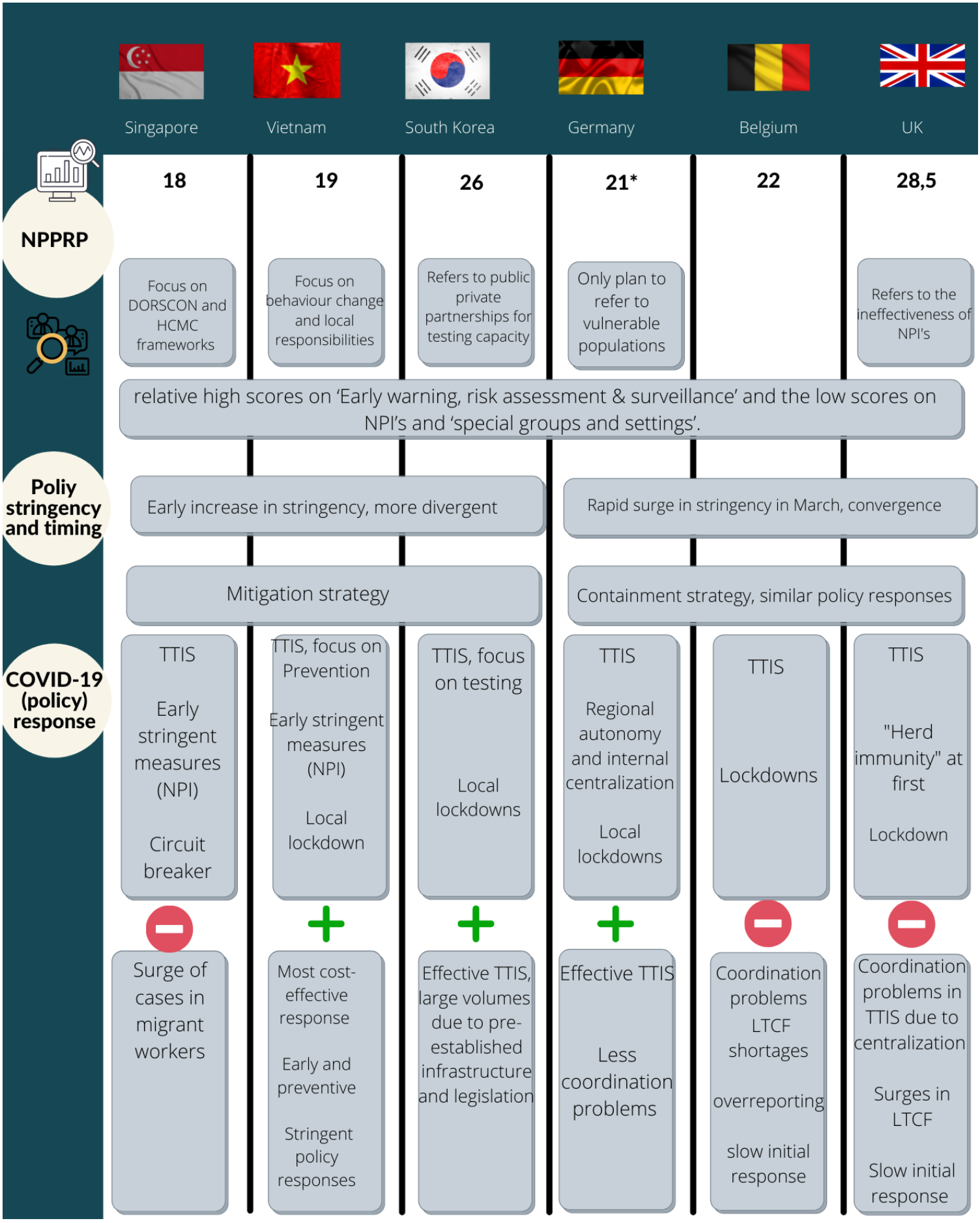


Figure 12: Summary

5. Discussion

This research aims to explore to explore how and if prior exposure to SARS-CoV-1 influenced SARS-CoV-2 (COVID-19) policy responses. Furthermore, it is addressed how these lessons and explorations could be translated into valuable lessons for future threats of emerging infectious diseases. An iterative approach was used, using various frameworks for structuring and explanations. In this research, both within and between-group comparisons were conducted on COVID-19 policy responses and departure systems in 1) Vietnam, South Korea and Singapore and 2) Germany, Belgium and the UK. First, a quantitative and qualitative review of the National Pandemic Preparedness and Response Plans (NPPRP) has been conducted, followed by an analysis of the actual policy responses. The actual policy responses were divided into the analysis of policy stringency and timing, and the comparison and analysis of the organizational structure, legislation, policies & strategies and the response mechanism, including intersectoral collaboration, communication, emergency resources, planning, and information management. Finally, a conceptual model is created based on the analysis of existing literature and frameworks that can guide the reflection on COVID-19 policy responses and learning to explore explanations of success or failure. For a short recap of the results, see Figure 12 on the previous page. In the following paragraphs we will discuss:

- Similarities and differences in COVID-19 policy responses and initial strategies
- Similarities and differences in the departure systems
- How the experience with SARS-CoV-1 shaped or influenced COVID-19 responses
- The quadruple learning loops
- Convergence and divergence
- Methodological reflection
- Theoretical reflections

Countries that were expected to be best prepared beforehand, especially the UK, were not the ones who performed well during COVID-19. Countries with more SARS-CoV-1 exposure, except for South Korea, scored lower compared to the European countries with less SARS-CoV-1 exposure. In this research, there is no indication that the quantitative assessment of NPPRP's holds predictive power on COVID-19 performance or preparedness. Quantitative and qualitative analysis revealed that little attention is given to detailed NPI's descriptions and the inclusion of vulnerable populations, while significantly more attention was provided to the description of monitoring and surveillance systems. To further investigate possible explanations, similarities and differences, policy responses and strategies were analyzed.

Policy responses and strategies

Similar sets of policy responses were implemented in Germany, the UK and Belgium, but they did not lead to comparable results. Singapore, Vietnam and South Korea also applied similar sets of measures and policies, but with more distinctive focus area's (preventive vs high capacity). Differences in strategies are witnessed between the two groups. The European countries implemented a mitigation strategy (the UK eventually switched from herd immunity to mitigation), while Asian countries enforced a containment strategy. In general, the Asian countries selected in this research took preventive measures in the early stages of the pandemic. In contrast to Europen countries, where rapid policy diffusion was witnessed around March 2020 after an initially slow response.

In the response of the Asian countries, especially Vietnam and South Korea seemed to apply tailored responses, focusing on either early prevention or resource-intensive testing and tracing programs. Government policy responses in Europe were similar following a mitigation strategy, with less stringent measures earlier on, becoming more stringent as cases increased. Vietnam, Singapore and South Korea responded swiftly by implementing a containment strategy, implementing more stringent measures earlier on. Furthermore, it appears to matter how and if vulnerable populations are included in policies, how (state) capacities are used, when they are used and whom they reach. That being said, the effective response also seems to build upon TTIS and NPI's requiring coordination, proper use of state capacities and supportive systems. The inclusiveness of high-risk groups in (social) policy, in both migrant worker dormitories or long-term-care facilities, was insufficient in Belgium, Singapore and the UK, resulting in unfavourable outcomes.

Departure system

It appears that fewer ad hoc changes in governance and power shifts were mentioned in the literature describing the responses of the Asian countries, and legislation was previously established contributing to increased testing and tracing capacity. In the UK and Germany, emergency laws were implemented, which led to shifts in governance decision-making power in the UK. The exposure of SARS-CoV-1 led to increased state and diagnostic capacities in South Korea and Singapore. At the same time, Vietnam seemed to be aware of its relatively less abundant healthcare capacity and responding with the most cost-effective response aimed at prevention. Germany entered the pandemic with relatively strong diagnostic capacity and state implementation capacity, contributing to its more successful response compared to the UK and Belgium. According to Jones & Hameiri (2021), the absence of effective state capacities, diffused responsibilities, and de facto reliance on ad hoc emergency measures are features that negatively influenced COVID-19 performance.

Experience with SARS-CoV-1

SARS-CoV-1 highlighted the pitfalls of a diffuse approach to pandemic management, which resulted in the buildup of national capacities enabling effective COVID-19 control in South Korea and Singapore and possibly shaped the initial response of Vietnam, which resonated with its available resources.

Quadruple learning loops

The four loops described in the conceptual framework elaborated how single, double, triple and quadruple loop learning contributed to the relatively successful response of South Korea, highlighting the importance of intra and interpandemic learning and the translation into improved supportive systems, organizational structures and legislation.

South Korea showed adaptive responses and learning ability due to its ability to translate changes in the external environment (time, target, context) to effective policy responses; this was mentioned as an important factor for its success. On the other hand, changes in the external environment (time, target, context) were not effectively translated to effective policies reaching vulnerable populations in the UK, Singapore and Belgium, leading to surges of cases. A recurring theme in the countries that performed less well were coordination problems and overlooking or not adequately addressing vulnerable groups. This requires considering the 'context' and changing assumptions and actions to realize effective policy responses.

Convergence and divergence

Compared to the Asian countries, Germany, Belgium, and the UK appear to show more similar responses in terms of policy stringency and the timing of implementation. The timing and strictness of policy responses show a pattern of convergence, with the stringency and timing becoming more similar as time passes. This trend of convergence in response could be the result of experience or learning. However, based on the insights of Bekker, Ivankovic, & Biermann (2020) this would require the presence of transparent and available data as a result of monitoring and sharing of experiences. Furthermore, this would require room for decision-making, reflection, back-talk and debate with multiple stakeholders out of society. Vietnam, South- Korea and Singapore appear to show a more unique or tailored response, differing more in terms of policy stringency and the timing of implementation.

Furthermore, the response appears to follow a more divergent pattern, showing some divergence over time in terms of stringency and the timing of implementation. The difference between the policy stringency and timing of European and Asian countries could indicate that prior exposure could translate into more unique and tailored responses due to previous learned lessons or changes in supportive systems. The observation of convergence and rapid increase in stringency in European countries could be due to 1) rapid policy diffusion 2) cross country policy learning or 3) as a result of the mitigation strategy and reactive response to surges in cases or a combination of these three points.

When exploring explanations for COVID-19 performance, it is necessary to consider the complex interplay and interdependence of COVID-19 policy responses and strategies, previous experiences and departure systems as described in the conceptual framework. During this research, I have learned that this pandemic should be seen as an incentive to collaborate, share and learn. Change itself should not be the goal, as copying responses is likely not as effective as desired. This research should be considered as a piece for agenda setting, emphasizing that complex problems require considerable attention from various disciplines that should be actively managed during interpandemic periods. Recognizing the complexity of the (socio) .behavioural dynamics that come with the implementation of NPI's, many researchers in biology, medicine, and public health are calling for greater involvement of social and .behavioural scientists in addressing infectious disease issues (Shannon & Willoughby, 2004). COVID-19 demanded the undivided attention of many disciplines, professions and experts. More importantly, it required collaboration and multidisciplinary expertise, which also needed to be managed and adapted during the pandemic. Governments need to sustain, stimulate and incorporate the 'multi-disciplinary webs and networks' in their institutional design (Arjen Boin, McConnell, & t Hart, 2021).

5.1.1 Methodological reflections

A strength of this research is found in the research design. Specific outbreak challenges vary per country, and in-depth knowledge is necessary to reflect on performance. Therefore, it is necessary to study the dynamic developments over a limited period of time intensively to get a better in-depth understanding instead of searching static explanations instead. Opting for a QCA with a most similar cases design and different outcomes within groups, enabled a comparison with control cases. By carefully selecting the groups based on similarities and differences, it enabled a more systematic

comparison in order to distil lessons and explanatory factors than regular qualitative case studies can offer.

The QCA was chosen because it was able to address a topic that is new, complex and influenced by multiple factors. The use of the QCA enabled a start in trying to identify what possible combinations of factors lead to specific outcomes. Although no causation can be attributed to the findings of this research, it did provide insights into the response, preparedness and characteristics of the selected countries. The design facilitated the acquirement of extensive case knowledge, which is required when addressing complex issues. By comparing and analysing different countries and groups, the variations and responses are explained to a certain extent, highlighting the importance of and complexity of public health interventions and policy responses.

Concerning the selection of countries, the ideal indicator would most likely be 'excess mortality'. This indicator considers the number of deaths from the previous year(s) and compares it to the time of interest. This indicator provides a more reliable comparison since it is not influenced by counting methods and testing policies, which likely influenced mortality and prevalence numbers. However, excess mortality is a 'slow statistic', meaning that it was not readily available or accurate for all countries at the time of writing. This indicator would be preferred and recommended in future research(S. L. Greer, E. J. King, et al., 2020).

The literature study in this research consisted of articles derived from Scopus and Web of Knowledge. Furthermore, several international databases have been used. However, it should be noted that the data derived from these databases are not always comparable. Data is being collected while the pandemic is still ongoing. Numbers and data on prevalence, incidence and mortality should be interpreted with caution, and results should be considered as a temporary indicator of potentially relevant factors. Differences in reporting and counting of cases can lead to incomparability of COVID-19 performance. For example, it is mentioned that Belgium opted for an approach that led to higher reported mortality rates which resulted in difficulties when comparing performance.

The tool used by the ECDC and Droogers et al. (2019) provided a helpful tool to assess plans and scores. However, the scores in this research were assessed by an individual. In future research, it would be advised to assess these plans with a minimum of two. The assessment of the plans was sometimes open to interpretation. To prevent bias as much as possible, it would require multiple researchers with preferably a background in epidemics, governance or public health.

5.1.2 Theoretical reflection

Due to the iterative character of this research, multiple theories and frameworks have found their way into this conceptual framework, each with its own strengths and limitations.

The framework used to guide the analysis of actual policy responses was "The public health emergency preparedness and response analysis framework" derived from He et al. (2020). This framework enables an analysis of the actual response but does not include aspects that consider the prior experience and adaptive capacity during the response. This model allows comparison but is less suitable for exploring explanations for varying performance. It does not facilitate an analysis that includes feedback loops, political choices and aspects like state capacity to review and reflect more holistically. The quadruple learning theory, on the other hand, did include room for learning and

adaptive capacity. Together with the addition of state capacity, the combination of these theories resulted in a conceptual framework.

The added value of the conceptual framework is found in the ability to reflect on countries response and adaptive capacity, and it takes into account a wide variety of factors that are likely to have contributed to differing outcomes. State capacity, resources and learning loops that take into account time, target, context and assumptions are added. Together with the input from various theories, literature, the “The public health emergency preparedness and response analysis framework” and the quadruple loop learning theory, it provides a useful tool to explore and reflect upon countries responses and explores explanations for varying performance, including politics, adaptive capacity, experience and various forms of (state) capacity. A factor that is not explicitly highlighted in this framework but which could influence outcomes or explain performance is the aspect of culture. Culture and acceptability of measures can influence what policy makers see as available policy options and can influence compliance. Previous experiences can increase the acceptability of measures by society and broaden policy options.

6. Conclusion

The resilience of crisis management systems has been tested during the first wave of COVID-19. However, the pandemic also uncovered the strengths of systems and organizations. Both the good and bad experiences provide opportunities to learn and adapt, preferably distilling lessons that leave their mark during interpandemic periods. The main research question aimed to gain insights into how and to what extent pandemic preparedness and COVID-19 responses of countries with and without large exposure to SARS-CoV-1 differentiate or share similarities and what might have been possible explanations.

To conclude, the assessment of the NPPRP could not explain preparedness as countries with high COVID-19 prevalence also scored high on the NPPRP assessment. Differences in strategy and capacity were witnessed, and differences in organisational structures, power shifts and (pre-established) legislation, which in turn can aid or limit effective COVID-19 policy responses. Based on the literature, Asian countries were better prepared due to previously learned lessons from SARS-CoV-1, which led to increased (state) capacities and supporting departure systems for effective COVID-19 policy response during the first wave of COVID-19. However, the control case of Singapore emphasizes the need for quadruple loop learning to ensure prolonged effective responses like in South Korea.

As pandemics are highly likely to present themselves in the future, countries and governments should take the opportunity to reflect, learn and adapt, both during pandemics as in preparation. Furthermore, the preparation of pandemic plans should reach further than the creation of an NPPRP and should include awareness and strengthening of capacities and a multidisciplinary approach, ensuring both inclusiveness and effectiveness.

Practical recommendations

Based on this research, the following suggestions are made to improve pandemic preparedness and to include in national plans:

1) Improve the risk assessment by being more specific on which vulnerable groups, in this case, migrant workers, are present and which meso-structures are essential to consider regarding infectious diseases. It is advised to consider how the population is composed in a country and how it is distributed. The guiding question could be: Who are potential risk groups considering disease transmission dynamics, where are they located, and how can they be facilitated to adhere to public measures?
2) Identify and communicate a clear authority structure and define roles regarding the organisation of pandemic diseases within a country to enable swift decision making and decrease coordination problems.
3) Identify both human and material resources and capacities, and let this guide strategies for both the long term and the short term. It is advised to answer the questions about which resources and capacities are present (specificity in all forms of state capacity and resources) and what we need in the long term. How does this resonate with proposed strategies? Furthermore, it is advised to critically asses the procurement and import of equipment (e.g. diagnostics, protective) and define the roles of private parties. Legislations can be used to either enable private parties to produce equipment rapidly or prevent them from exporting.
4) Include previous lessons from pandemics and epidemics, but consider that diseases transmissions and characteristics can differ significantly. Preparedness should include lessons learned, adaptive capacity and interpandemic learning. Find the right balance of planning,

routine and improvisation. Planning is needed to prepare; routine is needed to respond quickly, and improvisation is needed to adapt to changing circumstances. These require continuous learning and reflection.

5) Create protocols to identify and assess the effectiveness, public support, feasibility and implications for society of NPI's. The plans should clearly emphasize and identify the importance of communication with those affected by the imposed measures. On the one hand, communication should be a continuous process in order to facilitate policy learning and optimize NPI's based on input from those affected, while on the other, it is a tool to emphasize the importance of NPI's.

Furthermore, it is important that lessons learned result in changes, not for the sake of change but as a result of learning. Lessons learned from previous experiences can be prone to the recency' bias, as crisis-induced learning tends to focus on single experiences and their specific implications instead of a more comparative and longitudinal approach that takes into account multiple crises providing a more robust evidence base. However, it is important to keep in mind that these preparations "to fight the last war" does not ensure proper preparedness for future events. A more holistic approach and systemic changes might be required, including changing of beliefs, structures, systems, or even cultural acceptance to measures (Arjen Boin et al., 2021).

Future research

This research implied that COVID-19 policy response and outcomes are complex and require research that does not shy away from this complexity, even if that means causality is most likely unreachable. Results of this research illustrate the complexity and multitude of factors that influence and shape policy responses during the first wave of COVID-19, what variations in outcomes are present and how they can be explored. The variance in outcomes under most similar conditions cannot be explained by single factors or phenomena, but it does raise the question of how preparedness, adaptive capacity, and state capacity can be improved in the future. It requires in-depth knowledge of disease transmissions and how this links to societies, pre-existing social conditions and efficient use of state capacities. More research is needed on how pandemic preparedness can be improved in countries, how this can be assessed more accurately and how pandemic preparedness can be maintained during inter-pandemic periods. This requires a broad scope, incorporating all facets related to public health. Three recommendations for future research are given below.

1) An interesting starting point could be the comparison of top-ranked countries in the Global Health Index, scoring the highest on pandemic preparedness but performing worse compared to the lowest-ranked countries who performed better. This could gain insights into knowledge gaps of pandemic preparedness assessments.
2) Furthermore, the comparison of first-wave and second-wave responses and performances of countries that were labelled as bad performers in the first wave and more successful in subsequent waves would provide the opportunity to identify factors associated with this increase in performance. The other way around could also prove itself useful; countries that performed well initially and worse in subsequent waves. The conceptual framework in this research could guide the analysis to reflect on essential learning patterns and steps.
3) This research briefly described the reciprocal relation between resources, state capacities and strategy. However, more research is advised to gain more insights into this relationship and to explore the existence of a clear association between the availability (state) capacities,

resources and chosen strategies. A starting point for this research could be to investigate those who opted for herd immunity (or mitigation) strategies and to explore if differences and similarities are present in countries' capacities or resources.

7. References

Abdullah, W. J., & Kim, S. (2020). Singapore's Responses to the COVID-19 Outbreak: A Critical Assessment. *American Review of Public Administration, 50*(6-7), 770-776. doi:10.1177/0275074020942454

Amanat, F., & Krammer, F. (2020). SARS-CoV-2 vaccines: status report. *Immunity*.

An, B. Y., & Tang, S.-Y. (2020). Lessons From COVID-19 Responses in East Asia: Institutional Infrastructure and Enduring Policy Instruments. *The American Review of Public Administration, 50*(6-7), 790-800. doi:10.1177/0275074020943707

An, B. Y., & Tang, S. Y. (2020). Lessons From COVID-19 Responses in East Asia: Institutional Infrastructure and Enduring Policy Instruments. *American Review of Public Administration, 50*(6-7), 790-800. doi:10.1177/0275074020943707

Babin, S. (2020). Use of Weather Variables in SARS-CoV-2 Transmission Studies. *International Journal of Infectious Diseases, 100*, 333-336.

Bekker, M., Ivankovic, D., & Biermann, O. (2020). Early lessons from COVID-19 response and shifts in authority: public trust, policy legitimacy and political inclusion. *European Journal of Public Health, 30*(5), 854-855. doi:10.1093/eurpub/ckaa181

Bennett, B., & Carney, T. (2010). Law, ethics and pandemic preparedness: the importance of cross-jurisdictional and cross-cultural perspectives. *Australian and New Zealand Journal of Public Health, 34*(2), 106-112. doi:https://doi.org/10.1111/j.1753-6405.2010.00492.x

Berg-Schlosser, D., De Meur, G., Rihoux, B., & Ragin, C. C. (2009). Qualitative comparative analysis (QCA) as an approach. *Configurational comparative methods: Qualitative comparative analysis (QCA) and related techniques, 1*, 18.

Boin, A., Brock, K., Craft, J., Halligan, J., t Hart, P., Roy, J., . . . Turnbull, L. (2020). Beyond COVID-19: Five commentaries on expert knowledge, executive action, and accountability in governance and public administration. *Canadian Public Administration-Administration Publique Du Canada, 63*(3), 339-368. doi:10.1111/capa.12386

Boin, A., McConnell, A., & t Hart, P. (2021). Governing the Pandemic: The Politics of Navigating a Mega-Crisis. In: Springer Nature.

Campbell, D. T. (1975). III. "Degrees of Freedom" and the Case Study. *Comparative Political Studies, 8*(2), 178-193. doi:10.1177/001041407500800204

Carroll, W. D., Strenger, V., Eber, E., Porcaro, F., Cutrera, R., Fitzgerald, D. A., & Balfour-Lynn, I. M. (2020). European and United Kingdom COVID-19 pandemic experience: The same but different. *Paediatric Respiratory Reviews, 35*, 50-56. doi:10.1016/j.prrv.2020.06.012

CDC. (2017). *Pandemic Influenza Plan*. Retrieved from

Cevik, M., Marcus, J., Buckee, C., & Smith, T. (2020). SARS-CoV-2 transmission dynamics should inform policy. *Available at SSRN 3692807*.

Cho, H.-W. (2020). Effectiveness for the Response to COVID-19: The MERS Outbreak Containment Procedures. *Osong public health and research perspectives, 11*(1), 1-2. doi:10.24171/j.phrp.2020.11.1.01

Choi, E. K., & Lee, J. K. (2016). Changes of Global Infectious Disease Governance in 2000s: Rise of Global Health Security and Transformation of Infectious Disease Control System in South Korea. *Uisahak, 25*(3), 489-518. doi:10.13081/kjmh.2016.25.489

Chua, A. Q., Tan, M. M. J., Verma, M., Han, E. K. L., Hsu, L. Y., Cook, A. R., . . . Legido-Quigley, H. (2020). Health system resilience in managing the COVID-19 pandemic: lessons from Singapore. *Bmj Global Health, 5*(9). doi:10.1136/bmjgh-2020-003317

Cohen, A. K., & Cromwell, J. R. (2020). How to Respond to the COVID-19 Pandemic with More Creativity and Innovation. *Population Health Management, 24*(2), 153-155. doi:10.1089/pop.2020.0119

Data, O. W. i. (2021). Total confirmed COVID-19 deaths and cases per million people. Retrieved from https://ourworldindata.org/grapher/total-covid-cases-deaths-per-million?country=~OWID_WRL

Desson, Z., Weller, E., McMeekin, P., & Ammi, M. (2020). An analysis of the policy responses to the COVID-19 pandemic in France, Belgium, and Canada. *Health Policy and Technology, 9*(4), 430-446.

Desvars-Larrive, A., Dervic, E., Haug, N., Niederkrotenthaler, T., Chen, J., Di Natale, A., . . . Sorger, J. (2020). A structured open dataset of government interventions in response to COVID-19. *Scientific Data, 7*(1), 1-9.

DH Pandemic Influenza Preparedness Team. (2011). *UK Influenza Pandemic Preparedness Strategy 2011*.

Dinh, P. L., & Ho, T. T. (2020). How a collectivistic society won the first battle against COVID-19: Vietnam and their "weapons". *Inter-Asia Cultural Studies, 21*(4), 506-520. doi:10.1080/14649373.2020.1831811

Djalante, R., Nurhidayah, L., Van Minh, H., Phuong, N. T. N., Mahendradhata, Y., Trias, A., . . . Miller, M. A. (2020). COVID-19 and ASEAN responses: Comparative policy analysis. *Progress in Disaster Science, 8*. doi:10.1016/j.pdisas.2020.100129

Dodds, K., Broto, V. C., Detterbeck, K., Jones, M., Mamadouh, V., Ramutsindela, M., . . . Woon, C. Y. (2020). The COVID-19 pandemic: territorial, political and governance dimensions of the crisis. In: Taylor & Francis.

Dostal, J. M. (2020). Governing Under Pressure: German Policy Making During the Coronavirus Crisis. *Political Quarterly, 91*(3), 542-552. doi:10.1111/1467-923x.12865

Droogers, M., Ciotti, M., Kreidl, P., Melidou, A., Penttinen, P., Sellwood, C., . . . Snacken, R. (2019). European Pandemic Influenza Preparedness Planning: A Review of National Plans, July 2016. *Disaster Medicine and Public Health Preparedness, 13*(3), 582-592. doi:10.1017/dmp.2018.60

ECDC. (2017). *Guide to revision of national pandemic*

influenza preparedness plans - Lessons learned from the 2009 A(H1N1) pandemic. Retrieved from Stockholm:

ECDC. (2020). *Why is pandemic preparedness planning important?* Retrieved from https://www.ecdc.europa.eu/en/seasonal-influenza/preparedness/why-pandemic-preparedness

Eisner, E. W. (1991). Eisner, Elliot W., The Enlightened Eye: Qualitative Inquiry and the Enhancement of Educational Practice. New York: Macmillan, 1991. Prentice-Hall, 1998.

Gaskell, J., Stoker, G., Jennings, W., & Devine, D. (2020). Covid-19 and the Blunders of our Governments: Long-run System Failings Aggravated by Political Choices. *Political Quarterly, 91*(3), 523-533. doi:10.1111/1467-923x.12894

George, B., Verschuere, B., Wayenberg, E., & Zaki, B. L. (2020). A Guide to Benchmarking COVID-19 Performance Data. *Public Administration Review*.

Gianicolo, E., Riccetti, N., Blettner, M., & Karch, A. (2020). Epidemiological Measures in the Context of the COVID-19 Pandemic. *Deutsches Arzteblatt international, 117*(19), 336-342. doi:10.3238/arztebl.2020.0336

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The qualitative report, 8*(4), 597-607.

Greer, S., Jarman, H., Rozenblum, S., & Wismar, M. (2020). HOW ARE COUNTRIES CENTRALIZING GOVERNANCE AND AT WHAT STAGE ARE THEY DOING IT? In.

Greer, S. L., Jarman, H., Rozenblum, S., & Wismar, M. (2020). CENTRALISATION WITHIN AND BETWEEN GOVERNMENTS. *TEN, 26*(2), 99.

Greer, S. L., King, E. J., da Fonseca, E. M., & Peralta-Santos, A. (2020). The comparative politics of COVID-19: The need to understand government responses. *Global Public Health*, 1-4. doi:10.1080/17441692.2020.1783340

Greer, S. L., & Maetzke, M. (2012). Bacteria without borders: communicable disease politics in Europe. *Journal of Health Politics, Policy and Law, 37*(6), 887-914.

Hale, T., Angrist, N., Goldszmidt, R., Kira, B., Petherick, A., Phillips, T., . . . Majumdar, S. (2021). A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). *Nature Human Behaviour*, 1-10.

Hale, T., Petherick, A., Phillips, T., & Webster, S. (2020). Variation in government responses to COVID-19. *Blavatnik school of government working paper, 31*, 2020-2011.

Hanvoravongchai, P., Adisasmito, W., Chau, P. N., Conseil, A., De Sa, J., Krumkamp, R., . . . Shih, C.-S. (2010). Pandemic influenza preparedness and health systems challenges in Asia: results from rapid analyses in 6 Asian countries. *BMC public health, 10*(1), 1-11.

He, R., Zhang, J., Mao, Y., Degomme, O., & Zhang, W. H. (2020). Preparedness and responses faced during the covid-19 pandemic in belgium: An observational study and using the national open data. *International Journal of Environmental Research and Public Health, 17*(21), 1-14. doi:10.3390/ijerph17217985

Hewitt-Taylor, J. (2001). Use of constant comparative analysis in qualitative research. *Nursing Standard (through 2013), 15*(42), 39.

Hoepfl, M. C. (1997). Choosing qualitative research: A primer for technology education researchers. *Volume 9 Issue 1 (fall 1997)*.

HSRM. (2021). Retrieved from https://www.covid19healthsystem.org/mainpage.aspx

Janssen, M., & van der Voort, H. (2020). Agile and adaptive governance in crisis response: Lessons from the COVID-19 pandemic. *International Journal of Information Management, 55*, 102180. doi:https://doi.org/10.1016/j.ijinfomgt.2020.102180

Jenvald, J., Morin, M., Timpka, T., & Eriksson, H. (2007). Simulation as decision support in pandemic influenza preparedness and response. *Proceedings ISCRAM2007*, 295-304.

Jones, L., & Hameiri, S. (2021). COVID-19 and the failure of the neoliberal regulatory state. *Review of International Political Economy*, 1-25. doi:10.1080/09692290.2021.1892798

Kang H, Kwon S, & E., K. (2020). COVID-19 health system response monitor: Republic of Korea. In W. H. O. R. O. f. S.-E. Asia (Ed.).

Kaul, D. (2020). An overview of coronaviruses including the SARS-2 coronavirus - Molecular biology, epidemiology and clinical implications. *Curr Med Res Pract, 10*(2), 54-64. doi:10.1016/j.cmrp.2020.04.001

Kavanagh, M. M., & Singh, R. (2020). Democracy, Capacity, and Coercion in Pandemic Response: COVID-19 in Comparative Political Perspective. *Journal of Health Politics Policy and Law, 45*(6), 997-1012. doi:10.1215/03616878-8641530

Khan, W., Rifay, A. E., Malik, M., & Kayali, G. (2019). Influenza pandemic preparedness in the world health organization eastern mediterranean region. *Eastern Mediterranean Health Journal, 25*(8), 583-590. doi:10.26719/emhj.18.070

Kim, P. S. (2020). South Korea's fast response to coronavirus disease: implications on public policy and public management theory. *Public Management Review*. doi:10.1080/14719037.2020.1766266

Korea Centers for Disease Control & Prevention. (2006). *Pandemic Influenza Preparedness and Response Plan*.

Kuhlmann, S., Hellström, M., Ramberg, U., & Reiter, R. (2021). Tracing divergence in crisis governance: responses to the COVID-19 pandemic in France, Germany and Sweden compared. *International Review of Administrative Sciences*, 0020852320979359. doi:10.1177/0020852320979359

Kumar, D., Malviya, R., & Sharma, P. K. (2020). Corona virus: a review of COVID-19. *Eurasian Journal of Medicine and Oncology, 4*, 8-25.

Kusters, C. S. L., Batjes, K., Wigboldus, S. A., Brouwers, J., & Baguma, S. D. (2017). *managing for sustainable development impact*: Wageningen Centre for Development Innovation, Wageningen University & Research.

König, M., & Winkler, A. (2020). COVID-19 and Economic Growth: Does Good Government Performance Pay Off? *Intereconomics, 55*(4), 224-231. doi:10.1007/s10272-020-0906-0

La, V. P., Pham, T. H., Ho, M. T., Nguyen, M. H., Nguyen, K. L. P., Vuong, T. T., . . . Vuong, Q. H. (2020). Policy Response, Social Media and Science Journalism for the Sustainability of the Public Health System Amid the COVID-19 Outbreak: The Vietnam Lessons. *Sustainability, 12*(7). doi:10.3390/su12072931

Lee, C. C. M., Thampi, S., Lewin, B., Lim, T. J. D., Rippin, B., Wong, W. H., & Agrawal, R. V. (2020). Battling COVID-19: critical care and peri-operative healthcare resource management strategies in a tertiary academic medical centre in Singapore. *Anaesthesia*.

Lee, K., & Lim, C. (2001). Technological regimes, catching-up and leapfrogging: findings from the Korean industries. *Research Policy, 30*(3), 459-483. doi:https://doi.org/10.1016/S0048-7333(00)00088-3

Lee, S., Hwang, C., & Moon, M. J. (2020). Policy learning and crisis policy-making: quadruple-loop learning and COVID-19 responses in South Korea. *Policy and Society, 39*(3), 363-381. doi:10.1080/14494035.2020.1785195

Lee, S., Yeo, J., & Na, C. (2020). Learning before and during the COVID-19 outbreak: a comparative analysis of crisis learning in South Korea and the US. *International Review of Public Administration*, 1-18.

Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic Inquiry Sage Beverly Hills. *CA Google Scholar*.

Linh, T. N. Q., Hanh, T. T. T., & Shaw, R. (2020). COVID-19 initial preparedness and response in Vietnam during the first six months of the pandemic and the lessons for Sendai framework implementation. *International Journal of Disaster Resilience in the Built Environment*, 13. doi:10.1108/ijdrbe-07-2020-0080

Liverani, M., Hanvoravongchai, P., & Coker, R. (2013). Regional mechanisms of communicable disease control in Asia and Europe.

Lu, G., Razum, O., Jahn, A., Zhang, Y., Sutton, B., Sridhar, D., . . . Müller, O. (2021). COVID-19 in Germany and China: mitigation versus elimination strategy. *Global Health Action, 14*(1), 1875601. doi:10.1080/16549716.2021.1875601

Mahoney, J., & Goertz, G. (2006). A tale of two cultures: Contrasting quantitative and qualitative research. *Political analysis*, 227-249.

Mahy, P., Collard, J. M., Gala, J. L., Herman, P., Groof, D., Quoilin, S., & Sneyers, M. (2017). Health crises due to infectious and communicable diseases : European preparedness and response tools in an international context. *Journal of business continuity & emergency planning, 10*(4), 353-366.

Mao, Y. X. (2021). Political institutions, state capacity, and crisis management: A comparison of China and South Korea. *International Political Science Review*, 17. doi:10.1177/0192512121994026

Martin, R., Conseil, A., Longstaff, A., Kodo, J., Siegert, J., Duguet, A.-M., . . . Coker, R. (2010). Pandemic influenza control in Europe and the constraints resulting from incoherent public health laws. *BMC Public Health, 10*(1), 532.

Ministry of Health Singapore. (2014). MOH pandemic readiness and response plan for influenza and other acute respiratory diseases. In: MOH USA.

Miralles, O., Sanchez-Rodriguez, D., Marco, E., Annweiler, C., Baztan, A., Betancor, E., . . . Vall-llosera, E. Unmet needs, health policies, and actions during the COVID-19 pandemic: a report from six European countries. *European Geriatric Medicine*, 12. doi:10.1007/s41999-020-00415-x

Miralles, O., Sanchez-Rodriguez, D., Marco, E., Annweiler, C., Baztan, A., Betancor, E., . . . Vall-llosera, E. Unmet needs, health policies, and actions during the COVID-19 pandemic: a report from six European countries. *European Geriatric Medicine*. doi:10.1007/s41999-020-00415-x

Mitchell, F., Norreklit, H., Norreklit, L., Cinquini, L., Koeppe, F., Magnacca, F., . . . Liboriussen, J. M. Evaluating performance management of COVID-19 reality in three European countries: a pragmatic constructivist study. *Accounting Auditing & Accountability Journal*, 17. doi:10.1108/aaaj-08-2020-4778

Mogi, R., & Spijker, J. (2020). The influence of social and economic ties to the spread of COVID-19 in Europe.

Moore, K. A., Ostrowsky, J. T., Mehr, A. J., Osterholm, M. T., & Comm, C. P. P. (2020). Influenza response planning for the centers of excellence for influenza research and surveillance: Science preparedness for enhancing global health security. *Influenza and Other Respiratory Viruses, 14*(4), 444-451. doi:10.1111/irv.12742

Nicoll, A. (2010). Pandemic risk prevention in European countries: role of the ECDC in preparing for pandemics. *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz, 53*(12), 1267-1276.

O'Donnell, G., & Begg, H. (2020). Far from Well: The UK since COVID-19, and Learning to Follow the Science(s)*. *Fiscal Studies, 41*(4), 761-804. doi:10.1111/1475-5890.12253

Oh, S. Y. (2021). From a 'super spreader of MERS' to a 'super stopper' of COVID-19: Explaining the Evolution of South Korea's Effective Crisis Management System. *Journal of Asian Public Policy*. doi:10.1080/17516234.2020.1863540

Park , C., Kim , S., Schnitzler , F., & Kim, J. (2020). South Korea's response to the Coronavirus Pandemic – Update (May 2020). Retrieved from https://www.cambridge.org/core/blog/2020/04/09/south-koreas-response-to-the-coronavirus-pandemic/

Park, J., & Chung, E. (2021). Learning from past pandemic governance: Early response and Public-Private Partnerships in testing of COVID-19 in South Korea. *World Development, 137*. doi:10.1016/j.worlddev.2020.105198

Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. *Health services research, 34*(5 Pt 2), 1189.

Pattyn, V. (2014). De techniek van grootste gelijkenis en verschil (MSDO/MDSO). Een hulpmiddel voor de selectie van causaal relevante variabelen in een databestand met weinig casussen. *Kwalon. Tijdschrift voor Kwalitatief Onderzoek, 57*, 55-57.

Peter, W., & Horby, D. P. (2013). Prospects for emerging infections in East and Southeast Asia 10 years after severe acute respiratory syndrome. *Emerging infectious diseases, 19*(6), 853.

Phannajit, J., Takkavatakarn, K., Katavetin, P., Asawavichienjinda, T., Tungsanga, K., Praditpornsilpa, K., . . . Susantitaphong, P. (2020). Factors Associated with the Incidence and Mortality of Coronavirus Disease 2019 (COVID-19): A Systematic Review and Meta-Analysis. *Available at SSRN 3629473*.

Pérez, S. A. (2019). A Europe of creditor and debtor states: explaining the north/south divide in the Eurozone. *West European Politics, 42*(5), 989-1014.

Ragin, C. C. (2014). *The comparative method: Moving beyond qualitative and quantitative strategies*: Univ of California Press.

Rajan, S., Cylus, J., & McKee, M. (2020). Successful find-test-trace-isolate-support systems: how to win at snakes and ladders. *Eurohealth, 26*(2), 34-39.

Raoofi, A., Takian, A., Haghighi, H., Rajizadeh, A., Rezaei, Z., Radmerikhi, S., . . . Akbari Sari, A. (2021). COVID-19 and Comparative Health Policy Learning; the Experience of 10 Countries. *Arch Iran Med, 24*(3), 260-272. doi:10.34172/aim.2021.37

Rihoux, B. (2013). Qualitative comparative analysis (QCA), anno 2013: reframing the comparative method's seminal statements. *Swiss Political Science Review, 19*(2), 233-245.

Rihoux, B., & Ragin, C. C. (2008). *Configurational comparative methods: Qualitative comparative analysis (QCA) and related techniques* (Vol. 51): Sage Publications.

Roser, M., Ritchie, H., Ortiz-Ospina, E., & Hasell, J. (2020a). Coronavirus pandemic (COVID-19). *Our World in Data*.

Roser, M., Ritchie, H., Ortiz-Ospina, E., & Hasell, J. (2020b). Coronavirus pandemic (COVID-19). Published online at OurWorldInData. org. In.

Rozell, M. J., & Wilcox, C. (2020). Federalism in a Time of Plague: How Federal Systems Cope With Pandemic. *American Review of Public Administration, 50*(6-7), 519-525. doi:10.1177/0275074020941695

Ru, H., Yang, E., & Zou, K. (2021). Combating the COVID-19 Pandemic: The Role of the SARS Imprint. *Management Science*. doi:10.1287/mnsc.2021.4015

Schokkaert, E., & Luyten, J. (2020). Belgium's Response to the Coronavirus Pandemic Retrieved from https://www.cambridge.org/core/blog/tag/country-responses-to-the-covid19-pandemic/
Shannon, G. W., & Willoughby, J. (2004). Severe acute respiratory syndrome (SARS) in Asia: a medical geographic perspective. *Eurasian Geography and Economics, 45*(5), 359-381.
Sharma, A., Borah, S. B., & Moses, A. C. (2021). Responses to COVID-19: The role of governance, healthcare infrastructure, and learning from past pandemics. *Journal of business research, 122*, 597-607. doi:10.1016/j.jbusres.2020.09.011
Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for information, 22*(2), 63-75.
Thomann, E., & Maggetti, M. (2017). Designing Research With Qualitative Comparative Analysis (QCA): Approaches, Challenges, and Tools. *Sociological Methods & Research, 49*(2), 356-386. doi:10.1177/0049124117729700
Tung, L. T. (2021). Success in combating a pandemic: Role of fast policy responses. *World Development Perspectives, 21*, 100285. doi:https://doi.org/10.1016/j.wdp.2020.100285
Van Gunten, T. (2021). Visualizing the Network Structure of COVID-19 in Singapore. *Socius, 7*, 23780231211000171.
Verweij, S., & Gerrits, L. (2012). Systematische Kwalitatieve Vergelijkende Analyse (Systematic Qualitative Comparative Analysis). *Kwalon, 17*(3), 25-33.
Vietnam Ministry of Agriculture and Rural Development and Ministry of Health. (2011). *The Vietnam Integrated National Operational Program on Avian Influenza, Pandemic Preparedness and Emerging Infectious Diseases (AIPED), 2011-2015*.
WHO. (2003). Cumulative Number of Reported Probable Cases of SARS. Retrieved from https://www.who.int/csr/sars/country/2003_07_11/en/
WHO. (2005). *WHO checklist for influenza pandemic preparedness planning*.
WHO. (2018). A checklist for pandemic influenza risk and impact management: building capacity for pandemic response.
Wieler, L., Rexroth, U., & Gottschalk, R. (2020). Emerging COVID-19 success story: Germany's strong enabling environment. *Our World in Data*.
Wijesinghe, P. R., Ofrin, R. H., Bhola, A. K., Inbanathan, F. Y., & Bezbaruah, S. (2020). Pandemic influenza preparedness in the WHO South-East Asia Region: a model for planning regional preparedness for other priority high-threat pathogens. *WHO South-East Asia journal of public health, 9*(1), 43-49. doi:10.4103/2224-3151.282995
Woo, J. J. (2020). Policy capacity and Singapore's response to the COVID-19 pandemic. *Policy and Society, 39*(3), 345-362.
World Health, O. (2018). A checklist for pandemic influenza risk and impact management: building capacity for pandemic response.
Yan, B., Chen, B., Wu, L., Zhang, X. M., & Zhu, H. (2021). Culture, Institution, and COVID-19 First-Response Policy: A Qualitative Comparative Analysis of Thirty-One Countries. *Journal of Comparative Policy Analysis, 23*(2), 219-233. doi:10.1080/13876988.2021.1878458
Yoo, J. Y., Dutra, S. V. O., Fanfan, D., Sniffen, S., Wang, H., Siddiqui, J., . . . Groer, M. (2020). Comparative analysis of COVID-19 guidelines from six countries: a qualitative study on the US, China, South Korea, the UK, Brazil, and Haiti. *Bmc Public Health, 20*(1). doi:10.1186/s12889-020-09924-7
You, J. (2020). Lessons From South Korea's Covid-19 Policy Response. *American Review of Public Administration, 50*(6-7), 801-808. doi:10.1177/0275074020943708

8. Appendix

8.1.1 Introduction

Phannajit et al. (2019) published one of the first systematic reviews regarding the global incidence of COVID-19 and observed remarkable differences, identifying Europe and North America as the most severely affected regions. The highest incidence rate is observed in Europe (14,730 cases per 100,000 people), which deviates significantly from the incidence rate in Asia (480 cases per 100,000 people). The DCI (Daily Cumulative Index), which is calculated by dividing the cumulative cases by the number of days between the first reported case of each country, showed that Europe and North America reported higher numbers compared to Asia. North America recorded 437 cases per day, Europe 342 cases per day, while Asia reported 253 cases per day. These results, until the second of June 2020, are based on various online databases, including the WHO, Our World in Data and the ECDC (Phannajit et al., 2020). Although early in the Pandemic, these differences imply that some countries or regions seem to be doing relatively “better" regarding direct consequences in mortality and incidence. The same goes for indirect consequences, which translates into the ability to downscale measures decreasing socio-economic consequences (Roser et al., 2020a). Like König & Winkler (2020) state: ‘good crisis management pays off’, referring to their research that links government performance to economic outcomes. According to the authors, this variance could be explained by conditions that were pre-established such as demographics, obesity rates and international arrivals but also by the quality of government response.

8.1.2 Selection of countries

Group 1

To come to the selection of cases that correspond to the conditions that match this group, the experience with SARS-CoV-1 is analysed. As mentioned in the introduction by Shannon & Willoughby (2004), most cases were identified in Asia. This distribution corresponds to the WHO (2003) data, which provides a summary table of SARS cases per country. This data is visualised in Figure 1.

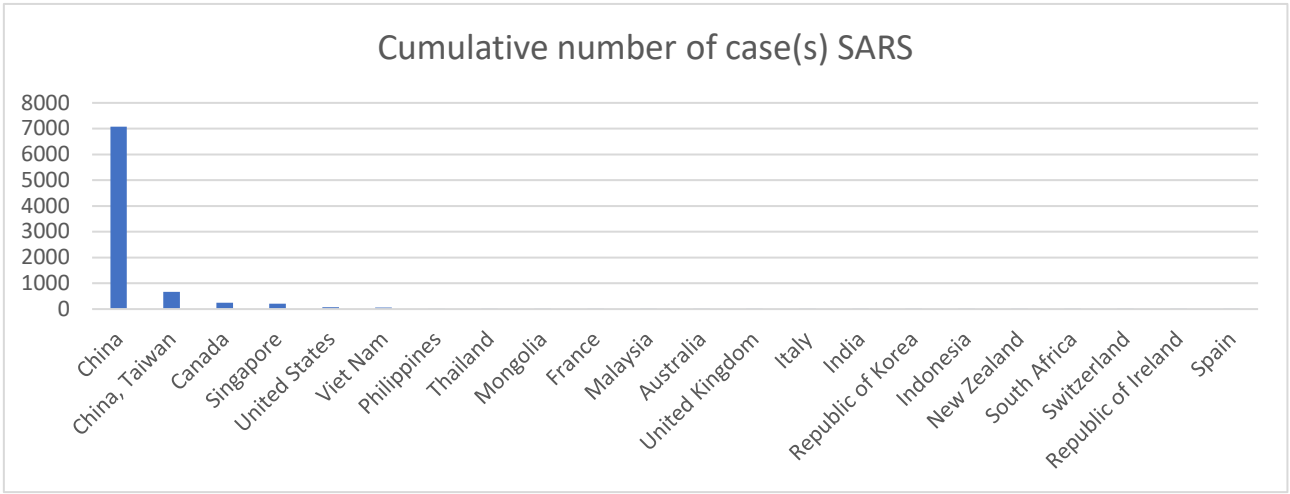


Figure 12: cumulative number of cases SARS-CoV-1 based on data from WHO (2003)

However, this Figure is primarily shaped by a large number of cases in China. To represent the distribution in other countries, China was excluded from Figure 2, which shows a more visually accessible representation of the distribution.

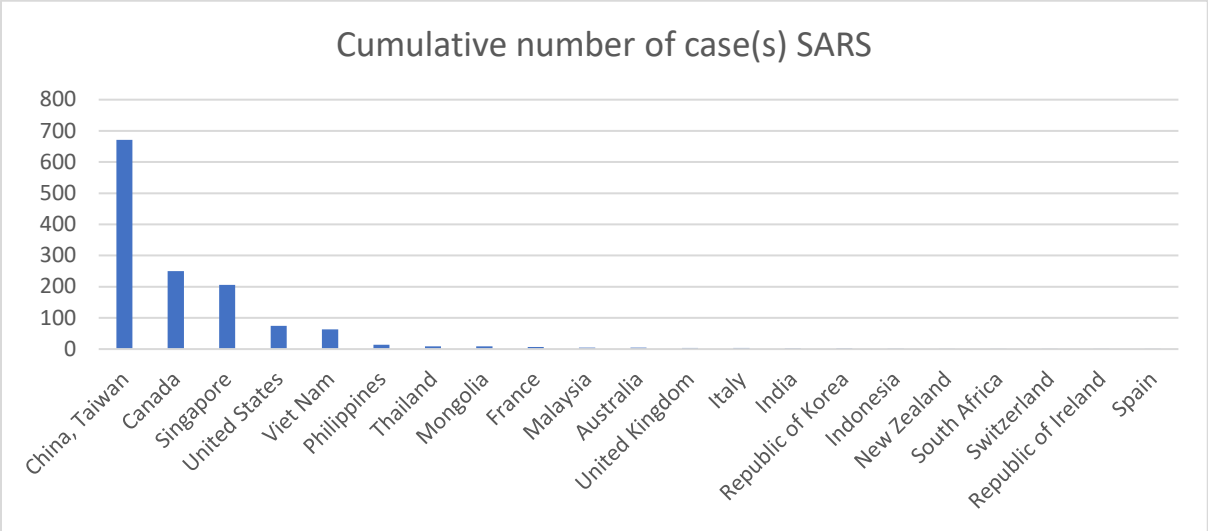


Figure 13: cumulative number of cases SARS-CoV-1, China excluded, based on data from WHO (2003)

The number of cases declined from 7 cases in France to 1 case in Spain. It is indicating that the number of cases is relatively high from Taiwan to Viet Nam but drops to a significantly smaller number after that. The same countries that are shown in Figure 2 are analysed in Figure 3. This Figure provides an overview of the cumulative COVID-19 cases per million to account for population size based on data from Our World in Data (2021).

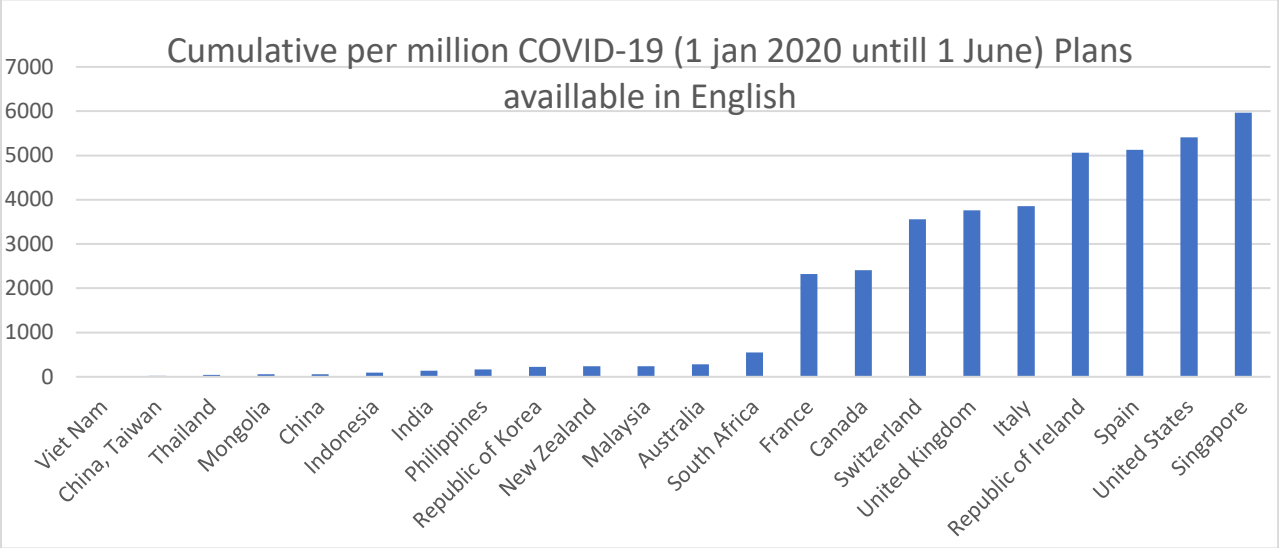


Figure 14: Cumulative COVID-19 per million based on data from Our World in Data (2021)

The countries are ranked on their position based on the numbers concerning SARS-CoV-1 and COVID-19. These ranks are combined into a total rank; the top 5 countries are shown in Table 2: Combined rank top 5 countries.

Table 8: Combined rank top 5 countries

Country	total rank
China, Taiwan	4
China	6
Viet Nam	7
Thailand	12
Mongolia	12

According to George, Verschuere, Wayenberg, & Zaki (2020), who wrote about benchmarking data across countries concerning COVID-19, another valuable indicator is testing policy. This indicator provides a clear indicator of important output. The weakness they identified by using this indicator is its reliance on strategy and policy, which in this research is exactly the focus. Therefore, to gain insights if the previous selection of top countries is justified, a comparison is made between the top 5 countries and the bottom 5. Using the data from Roser, Ritchie, Ortiz-Ospina, & Hasell (Roser, Ritchie, Ortiz-Ospina, & Hasell, 2020b), who publish data on the webpage Our World in Data, Figure 4: Share of positive tests top 5 combined rank against bottom five combined rank. Figure 4 is made to compare the total ranks of the top 5 countries to the bottom five. Complementing the suggestions to look at testing policy, Roser et al., (2020b) suggest looking at the percentage of positive tests. This number should ideally be deficient. A high number could imply that a country is likely not identifying a large share of cases. A low number indicates that the number of confirmed cases is closer to the number of total cases.

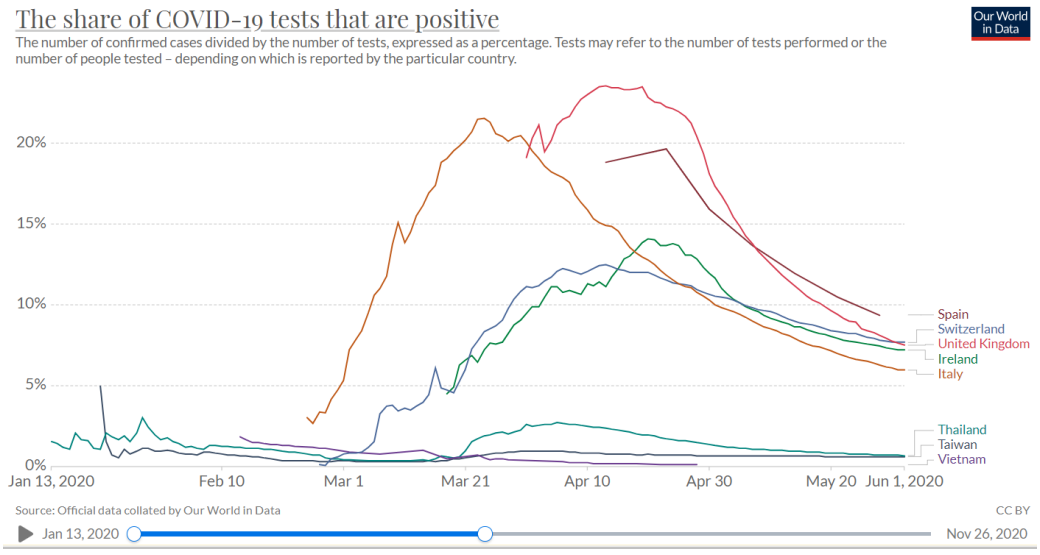


Figure 15: Share of positive tests top 5 combined rank against bottom five combined rank, Based on data from our World in Data (2020)

Figure 4 complements the previous Figures by validating the ranked data due to the significant differences between the top five countries selected and the bottom five. However, the data from China and Mongolia is not present.

Out of the previous Figures, only Figure 4 and Figure 3 include a denominator (per million). In the early phases of a pandemic, the spread is characterised by exponential growth. Therefore, the absolute number provides a more accurate and valid representation of the spread of the diseases. In the early phase, numbers and cases result from the transmission capacity of the infectious agent and are independent of the population size (Gianicolo, Riccetti, Blettner, & Karch, 2020). Due to the relatively small number of SARS-CoV-1 cases compared to COVID-19, the graphs concerning SARS-COV-1 are shown without a denominator.

As shown in Figure 3, Viet Nam has had a low COVID-19 incidence while being amongst the top 5 countries with the most SARS cases (Figure 2). Due to the lack of data and suitability for comparison due to governance structure China is excluded. The selection of the second country was based on literature. Although not heavily burdened with SARS-CoV-1 cases, literature pointed out that South Korea made significant changes based on its experience. It resulted in the creation of the KCDC, the Korea Centers for Disease Control and Prevention (Cho, 2020), which was established in 2004. The creation of KCDC can be seen as the adoption of a new international health regulation system based upon SARS-CoV-1 experience (Choi & Lee, 2016).

Group 2

The second group is characterised by having less/no exposure to SARS-CoV-1 but performing relatively well during COVID-19. For this group, a selection will be made out of European countries because, as seen in Figure 1 and Figure 2, it had relatively less exposure to SARS-CoV-1 than Asia and North America. The availability of documents in English will be more likely. The selection is based on countries that are a member of the European Union to limit the number of countries. As shown in Figure 5, the EU and Europe share similar cumulative cases per million, with the EU even having a surplus between march and the End of April compared to Europe.

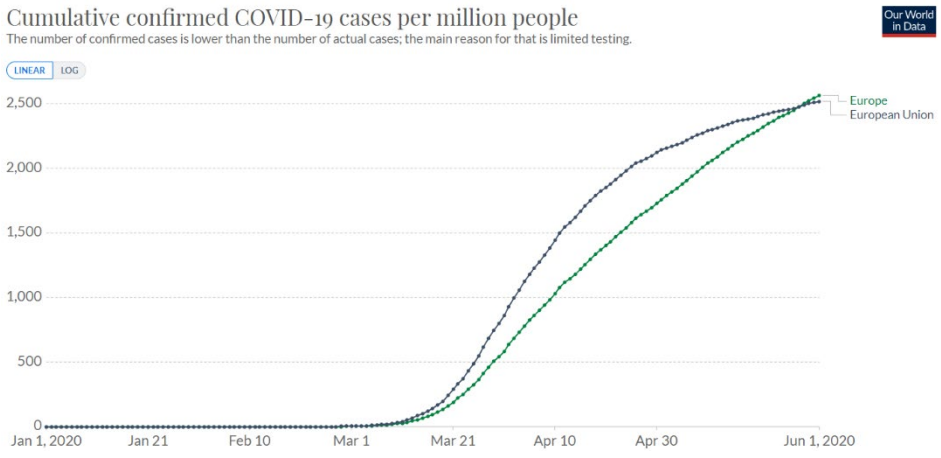


Figure 16: cumulative confirmed cases EU and Europe per million, Our world in Data (2020)

Table 3: "EIU, CM, stringency, Deaths per million and start stringency for OECD countries" is derived from König & Winkler (2020) and consists out of a variety of indicators in order to measure the performance of OECD countries concerning COVID-19. The EIU index is derived from the Economist Intelligence Unit, and the CM index is produced by König & Winkler (2020). Both are described below.

The EIU created an index that assesses the quality of the government response to the COVID-19 pandemic. It entails three components that measure the 'quality of response' (number of tests, provision of non-COVID-19 healthcare and the number of above-average excess deaths), complemented by three pre-existing risk factors (share of older population, obesity prevalence and number of international arrivals). The index is available for 21 OECD countries.

It indicates that New Zealand, Austria, Germany, Australia, Denmark, Iceland, Israel and Norway have performed best in handling the pandemic by responding early and adequately, resulting in the absence of nation-wide lockdowns. Furthermore, they incorporated extensive tracking and testing programs. According to the authors, this led to a relatively low fatality rate, even though rates are quite heterogeneous within the group. Besides the low fatality rate, they have provided healthcare services to non-COVID-19 patients while having a large population above 65. The CM index is composed out of the number of deaths per million inhabitants and the stringency of the government-imposed measures (Hale, Petherick, Phillips, & Webster, 2020).

Out of the EU country members, Austria, Germany, and Denmark have performed very well in handling the COVID-19 pandemic. Extensive tracking and testing programs were initiated. These measures led to a relatively low fatality rate while continuing healthcare services to non-COVID-19 patients. The large percentage of the populations that is older than 65 adds even more value to this accomplishment (König & Winkler, 2020).

Table 9: EIU, CM, stringency, Deaths per million and start stringency for OECD countries

Country	EIU	Rank	CM (ln)	Rank	Stringency	Rank	Deaths per million	Rank	Start stringency	Delay
New Zealand	3.67	1	5.27	2	41.86	11	4.64	2	21	-37
Austria	3.56	2	8.06	8	40.44	9	77.94	8	23	-4
Germany	3.56	3	8.37	9	40.32	8	107.39	10	54	-2
Australia	3.44	4	5.12	1	40.11	6	4.14	1	57	0
Denmark	3.44	5	8.38	10	41.72	10	104.83	9	24	0
Iceland	3.44	6	6.85	5	31.75	3	29.7	5	22	-37
Israel	3.44	7	7.55	7	51.55	19	36.75	6	26	-26
Norway	3.44	8	7.48	6	38.06	4	46.65	7	30	-27
Portugal	3.22	9	8.84	11	46.05	17	150.45	11	25	-37
Chile	3.11	10	9.21	13	39.53	5	252.6	13	32	12
France	3.11	11	10.08	17	51.94	20	457.47	16	73	10
USA	3.11	12	9.70	16	43.84	15	372.91	15	22	-2
Switzerland	2.89	13	8.98	12	40.30	7	197.17	12	55	-1
Japan	2.89	14	5.44	3	30.80	2	7.61	4	6	-8
South Korea	2.78	15	5.48	4	43.28	14	5.51	3	30	11
Sweden	2.56	16	9.51	14	25.73	1	522.38	17	68	37
Netherlands	2.44	17	9.63	15	42.54	13	357.39	14	65	7
Spain	2.22	18	10.28	19	47.55	18	615.77	19	30	-1
UK	2.22	19	10.21	18	42.26	12	641.64	20	32	2
Italy	2.22	20	10.35	20	54.62	21	571.94	18	22	-8
Belgium	2.11	21	10.56	21	45.71	16	846.7	21	27	-7

However, none of these three countries (Denmark, Germany and Austria) have English national pandemic preparedness and response plans. Germany has a summary of its plan available, and translation or secondary sources could be used to score and analyse its plan.

Group 3

The third group should have had prior exposure to SARS-CoV1 and have had a relatively less performance during the first wave of COVID-19. Based on Figure 2and Figure 3, a country with a relatively large number of SARS-CoV-1 cases and performing relatively less during COVID-19 is Singapore.

Group 4

Table 3 indicates that Spain, the UK, Italy and Belgium scored the lowest (König & Winkler, 2020). When looking at the data derived from Roser et al. (2020) derived from Our World in Data in Figure 3 and, these countries also have large numbers of cumulative confirmed cases per million (Figure 3). However, looking at the peaks of the highest percentage of positive tests (Figure 4), the UK and Belgium both have high peaks indicating a large percentage of positive tests. Furthermore, they both are North-European countries and therefore are most likely more similar to Germany due to the divide between North and South Europe in terms of financial position(Pérez, 2019), demographics and cultural country-specific factors(Mogi & Spijker, 2020)

8.1.3 Figures and argumentation for the chosen timeframe

Based on the Figure below, the end date is set at the 1st of August to acquire a time frame that provides enough time to evaluate and explore the responses while keeping the research feasible in terms of time and information. No steep increase in cumulative cases is observed before the 1st of August. As shown in Figure 6, steep increases regarding cumulative cases occur after the 1st of August in the UK, Germany, and Belgium. Figure 7 and Figure 8 give a more representative visualisation of the countries selected from the Asian region. Although Vietnam and South Korea show an earlier increase in cumulative compared to the European countries, this occurs after the 1st of August. Singapore shows a steep increase from March onwards but is selected as the most deviant case compared to South Korea and Vietnam.

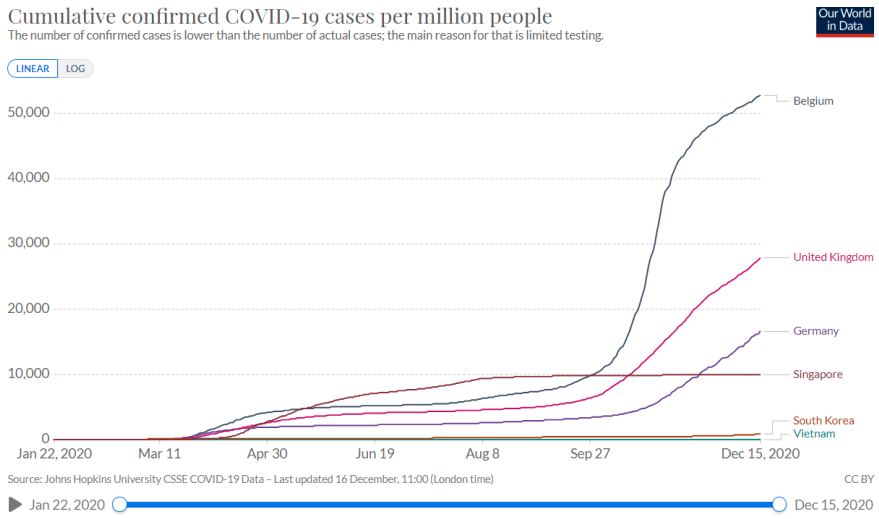


Figure 17: Cumulative cases selected countries based on Our World in Data (2020)

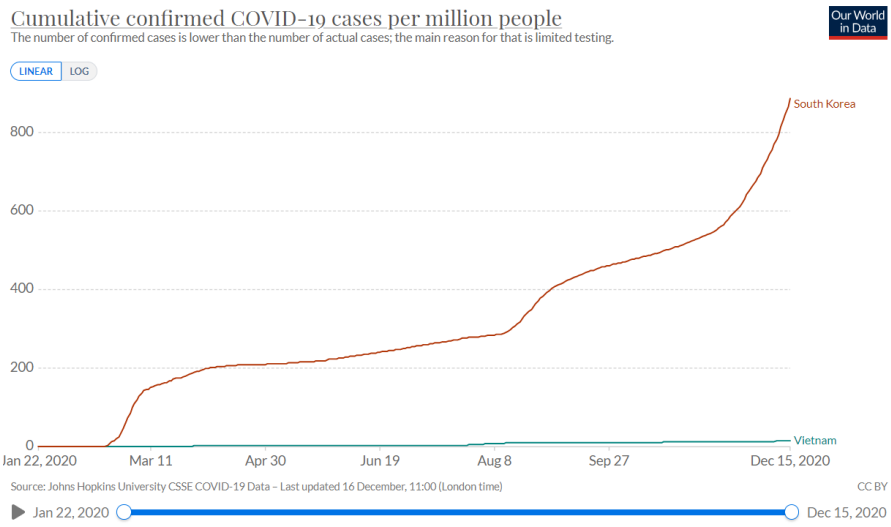
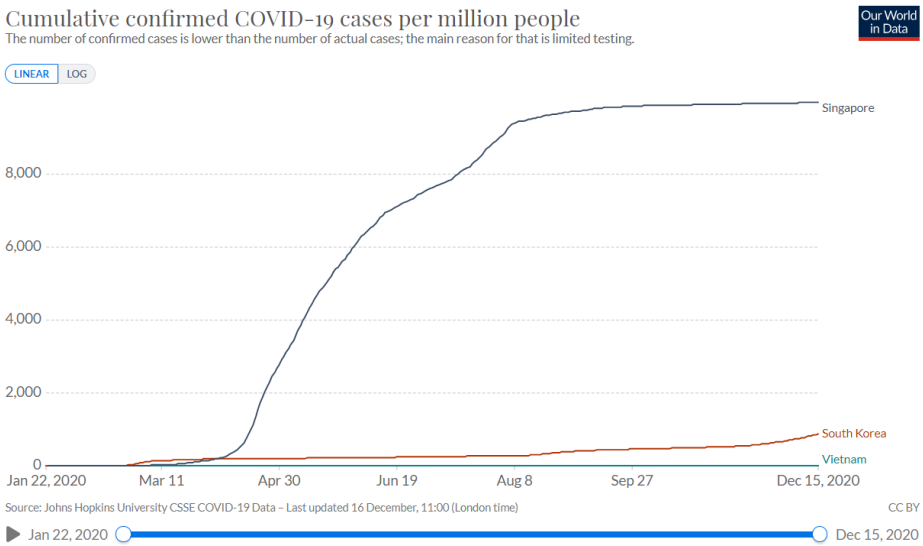


Figure 18: Cumulative cases Asian countries Based on Our world in Data (2020)

Figure 19: Cumulative cases Vietnam and South Korea based on Our World in Data (2020)

8.1.4 Adjusted scoring tool Droogers et al. (2019)

Table 10: search terms tool Droogers et al., (2019)



Theme	Item	Control F word	Synonyms

Preparedness planning	1 Simulation exercises	**simulation exercises**. **Simulatie oefening**	
	2 National planning committee	**national planning/preparedness committee**. **Committee, bestuur**	Board
	3 Evaluation methodology	**methodology** to **evaluate** the pandemic **mitigation measures** **methodologie, evalueren**	
Strategic planning	4 Activation/de-escalation triggers	defined, country-specific **triggers** for activation and de-escalation of **mitigation measures**. Aanleiding, prikkel, stimulans, activat*	
	5 Ethical aspects	**ethical** aspects of mitigation measures ethiek, ethisch	
	6 Planning assumptions	realistic, country-specific **planning assumptions** **planning, assumptie, veronderstelling**	
Risk-based planning	7 Risk assessment capacity	capacity and processes to perform national and subnational **risk assessments** **risico, schatting, beoordeling**	
	8 National surveillance and monitoring	**national surveillance system** to collect and analyse epidemiological and virological data national, surveillance, systeem	
	9 Differentiated response planning	possibility of **differentiated responses** depending on the situation **severity.** **Gedifferentieerd, fase, ernst**	Differ*
Command control, coordination & monitoring	10 Crisis management system	describes activation of **health sector** and multisectoral **crisis management** systems. Crisis, gezondheidszorg	healthcare
	11 Decision-making data requirements	defines information **requirements** for **decision-making**. Criteria, besluitvorming	
	12 Technical advice for decision-making links	**crisis management** system links to technical and decision-making levels	
Risk communication	13 Communications strategy	describes the need for a **communication strategy** for the preparedness and response phases. communicatie	Risk communication
measures	14 Communication channels	pandemic **communications** to different **groups** communicatie, groepen	Risk Communication

	15 Cross-border communication coordination	describes methods to coordinate **communication** with neighboring countries communciatie	Early warning response system
Early warning, risk assessment & surveillance	16 Investigation of first cases	specifies the approach for **rapid investigation** of the **first indigenous cases**. Eerst*	
	17 Routine seasonal surveillance	availability of sustainable, **routine** seasonal influenza **surveillance** that can be adapted to pandemic requirements.	Sentinel
	18 Surveillance feedback	describes the processes to provide **feedback** to **surveillance** stakeholders and others terugkoppeling, belanghebbenden	
	19 Adaptable laboratory surveillance	describes differential **laboratory testing** depending on the situation severity laborator*	
Health care system preparedness and response	20 Existing health care capacity awareness	identifies the need for awareness of **health care capacities** at the time of activation. Eerste lijn, capaciteit, gezondheidszorg, ziekenhui*	
	21 Surge capacity	**surge capacity** for laboratory tests and patient care piek, capaciteit	
Organisation?	22 Health care information exchange	proposes establishment of a **network** of clinicians, nurses, public health authorities, and health care authorities for frequent and rapid **information exchange**. Netwerk, uitwisseling	
Nonpharmaceutical public health interventions (NPIs)	23 NPI policy	policy describing the relevant **NPI**s. Preventie*	Non pharmaceutical interventions, public health measures, mitigation measures
	24 NPI communication strategy	refers to a **strategy** to **communicate** NPIs to the public and other target groups communicatie, strategy	
Essential services & business continuity	25 Essential services identification	**essential** public and private services. Essenti*	
organisation	26 Health business continuity	requires the ministry of health, key public health agencies, and major health facilities to have **business continuity** plans.	

		Continuiteit	
	27 Vulnerable group support	identified methodologies to support **vulnerable groups** kwetsbare	Risk groups, high-risk groups
Special groups and settings	28 Business and workplace preparedness	**preparedness/business continuity** for businesses and workplaces continuiteit	
	29 Vulnerable populations	to specific actions for **migrants,** persons in **transit,** and **hard-to-reach** populations migrant*, reizen, reizigers, moeilijk bereikbare groepen	remote
	30 Third sector engagement	describes roles for **third sector organisations: nongovernmental organisations, volunteer organisations, or community-based organisations**	
Score			

8.1.5 Adjusted scoring tool ECDC (2016)

Table 11: topics and search terms ECDC

ECDC	Synonyms/ other search words
1. **NPIs** based on **evidence**, **international guidance** and **best practice** – all likely to be effective and feasible for the setting/country – are included in the pandemic plan. Their implementation and timing depend on the actual situation and severity in a pandemic.	Public health measures
2. The public will be **informed** about the measures they can take to protect themselves and others from getting ill. Such information is part **of seasonal influenza campaigns** and is re-emphasised in a pandemic.	Communication
3. **Social distancing measures**, closure of schools, pre-schools and other educational institutions, banning of mass gatherings, adjusted working patterns, or advising contacts of cases to reduce their social interactions, are considered.	Public health measures
4. Advice **travellers**.	Travel, tourists, flights

5. **Communicating** with those who will implement the measures and those that will be affected, e.g. parents and teachers by school closures, and both the mechanisms and messages have been **tested**.	Communication,
6. The **benefit–cost ratio** and **feasibility** of **NPIs** has been calculated and assessed in advance. a. **Legal** and **ethical** ramifications and effects of NPIs, **risk mitigation** strategies have been considered.	
7. The **scientific evidence** for the effects has been weighed against **socio-political** considerations and their negative impact.	
8. Identifies **triggers** that determine when a particular measure will be **implemented** and **terminated**.	phase
9. Mechanisms for **monitoring** the **effects**/**effectiveness** of **NPI**s have been identified.	Public health measures, non-pharmaceutical interventions
10. **Off-the-shelf research protocols** with prior ethical and review board approvals implemented in order to study the effectiveness and response to non-pharmaceutical countermeasures.	

8.1.6 What are National Pandemic preparedness and response plans

Three major actors develop and publish guidelines concerning national pandemic response plans: the WHO, the CDC and the ECDC. Table 1 summarises the recommended/desired topics to be addressed in national pandemic preparedness and response plans. The WHO published "A checklist for pandemic influenza risk and impact management' in 2018, replacing the previous 2005 checklist. The novel checklist aims to guide nations to develop or revise NPPRPs (Wijesinghe et al., 2020). The ECDC published a technical report, "Guide to revision of national pandemic influenza preparedness plans", in 2017. The CDC published 'the Pandemic Influenza Plan" in 2017.

The World Health Organization (WHO) provides guidance, instructions and recommendations regarding a wide range of health issues to countries worldwide. Furthermore, it provides information and advice on how to handle an outbreak of pandemic influenza or other diseases. Most of the time, these recommendations and advice are used when national governments develop policies and plans. Although the WHO and other international organizations like the ECDC and CDC provide information and advice, local authorities remain responsible for the actual planning, preparation and

implementation, considering national policy and local conditions (Jenvald, Morin, Timpka, & Eriksson, 2007).

The goal of creating a national pandemic preparedness and response plan, including the recommended preparations and planning, is to enable countries to prepare and anticipate in advance. Planning may help lower the transmission of diseases, decrease cases, hospitalizations and deaths, and maintain essential services and minimize both the economic and social impact that a pandemic could have (WHO, 2005).

According to the ECDC (2017), general principles should be applied to optimize the effectiveness of pandemic preparedness. It should be based on "generic preparedness platforms structures, mechanisms and plans for crisis and emergency management". It should strengthen pre-established systems instead of creating new ones, especially building upon the national seasonal influenza prevention program. Although COVID-19 differs from the influenza virus, the outbreak shares characteristics to pandemic influenza and emphasizes the importance of rapid mobilisation of critical scientific research as part of the overall response(Moore, Ostrowsky, Mehr, Osterholm, & Comm, 2020). When a novel system does make its appearance during a pandemic, it should be tested during the inter-pandemic period. Preferably, responses should be based on the actual situation based on risk assessments and evidence-based, while the planning should be based on pandemics of varying severity. The planning process itself, including the testing or revision of plans to also familiarise important stakeholders, is crucial and might prove more valuable than the pandemic plan itself (ECDC, 2017).

Technical guidelines

According to the WHO (2018), the following elements should be covered in NPPRP's in the section 'preparing for an emergency': Planning, coordination and resources, Legal and policy issues, Ethical issues, Risk communication, Points of entry and Travel restrictions, risk management, preventing illness in the community, maintaining essential services and recovery, and evaluating testing and revising plans. These are elaborated upon below.

Table 12: Key area's

Planning, coordination and resources	A clear division of tasks and recourses is essential. Ensuring that actors are aware of their roles and responsibilities, have capacities and resources, understand their role, and are capable of working together (WHO, 2018).
Legal and policy issues	the WHO described law as a crucial component when creating sound national policies which address pandemics, and underscores the necessity of a legal framework
Ethical issues	Ethical issues are in their turn essential when developing legal frameworks that are targeted at pandemics. Protecting health on the one hand and individual rights and freedom on the other.
Risk communication	According to the ECDC (2017) Risk communication is a crucial public health tool in pandemic planning and in the response to a pandemic.
Points of entry and travel restrictions	Points of entry are all the options one has to enter of leave a nation. These should be strengthened and process capacities in order to prevent, prepare for and respond to public health risks (WHO,2018).

Risk management and risk assessment	Countries might encounter non-identical risks, and are therefore encouraged to develop their own risk assessment guided by local circumstances, which in turn guides risk management and adaptability to different phases. (Wijesinghe et al., 2020).
Surveillance	Pandemic responses will be based on surveillance, which is essential to provide information and to pandemic preparedness (WHO, 2018; CDC,2017). All of the national documents should describe their current epidemiologic surveillance system.
Preventing illness in the community	Non-pharmaceutical interventions are the first line of defense in influenza pandemics and a critical element of pandemic preparedness (WHO,2017; CDC,2017, ECDC,2017). Effective implementation relies on public awareness, acceptance, intersectoral collaboration (WHO,2018)
Maintaining essential services and recovery	Communities require access to essential services in order to keep up welfare and stability in times of a pandemic (WHO, 2018; ECDC, 2017). Pandemic recovery actions should be balanced by preparedness activities to prepare for possible subsequent waves (WHO, 2018).
Evaluation, testing and revising plans.	Evaluation provides essential information regarding the effectiveness of pandemic preparedness, response and recovery activities.

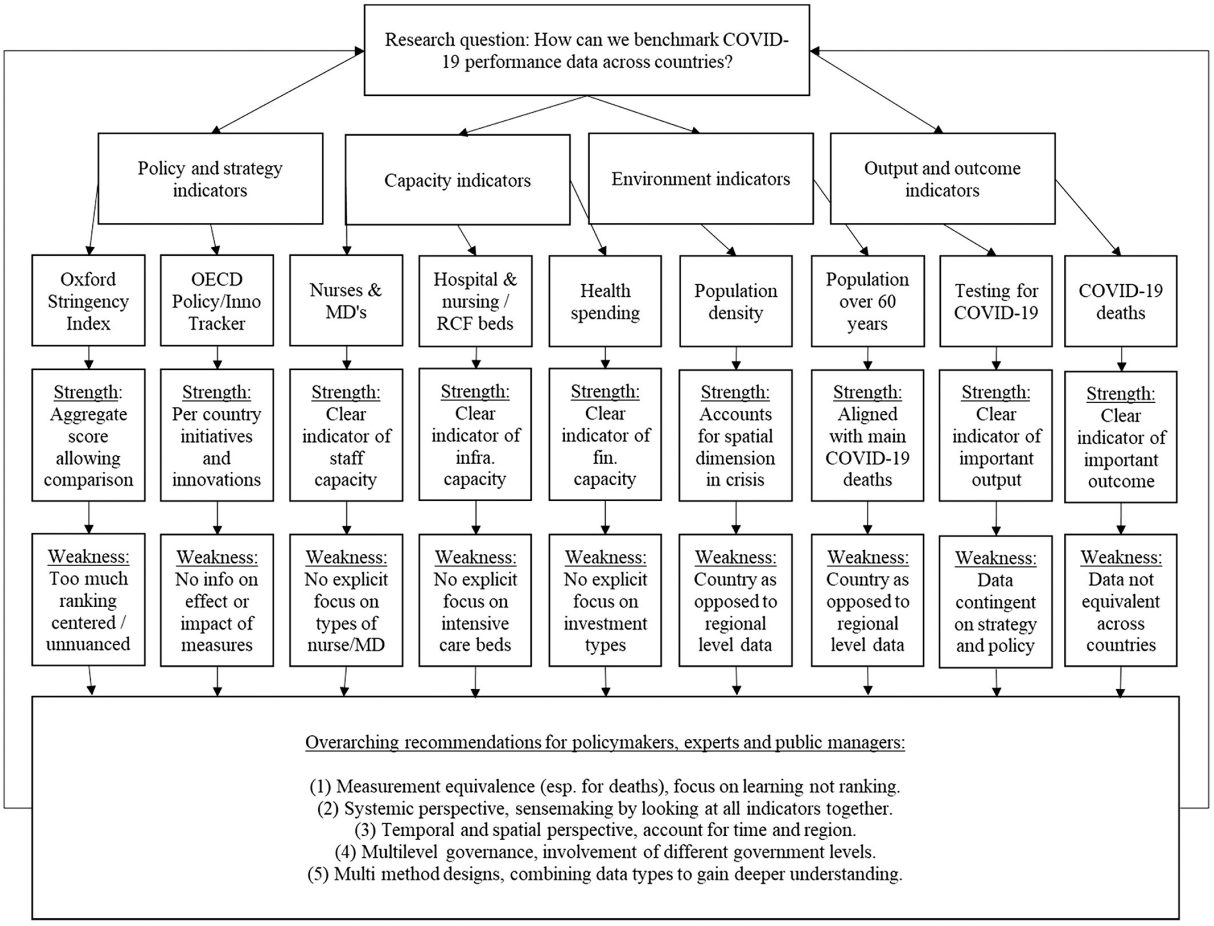
8.1.7 Summary table

		Score (own assesment using tool Droogers and ECDC NPI												Scores used in the research fro		
Category	**Item**	**South Korea**	**Vietnam**	**Singapore**	**UK**	**Belgium**	**Germany**	**horizontal scores total**	**Scores Asia**	**Scores Europe**	**Category total**	**Category asia**	**Category Europe**	**UK**	**Belgium**	**Germany**
Preparedness	1 Simulation exercises planning															
	2 National planning committee															
	3 Evaluation methodology															
Strategic planr	4 Activation/de-escalation triggers															
	5 Ethical aspects															
	6 Planning assumptions															
Risk-based pla	7 Risk assessment capacity															
	8 National surveillance and monitoring															
	9 Differentiated response planning															
Command con	10 Crisis management system															
	11 Decision-making data requirements															
	12 Technical advice for decision-making links															
Risk communi	13 Communications strategy															
	14 Communication channels															
	15 Cross-border communication coordination															
Early warning,	16 Investigation of first cases															
	17 Routine seasonal surveillance															
	18 Surveillance feedback															
	19 Adaptable laboratory surveillance															
Health care sy	26 Existing health care capacity awareness															
	27 Surge capacity															
	28 Health care information exchange															
Nonpharmace	29 NPI policy															
	30 NPI communication strategy															
NPI ECDC	1	For description see appendix														
	2	For description see appendix														
	Advice for	For description see appendix														
	3	For description see appendix														
	4	For description see appendix														
	5	For description see appendix														
	6	For description see appendix														
	6	For description see appendix														
	7	For description see appendix														
	8	For description see appendix														
Essential servi	31 Essential services identification															
	32 Health business continuity															
	33 Vulnerable group support															
Special groups	34 Business and workplace preparedness															
	35 Vulnerable populations															
	36 Third sector engagement															
Score																
Total																
Pages																
Year																
Updated																

8.1.8 Countries experience SARS-CoV-1, cumulative COVID-19 per million and availability of Pandemic Preparedness and Response Plans

Country	Cumulative number of case(s)	Country	Cumulative per million (1 Jan 2020 until 1 June)	English pandemic plan	YEAR	Double check	YEAR
Australia	5	Australia	282,16	YES	2009		
Brazil	1	Brazil	2422,14	NO			
Canada	250	Canada	2409,4	YES	2005		
China	7083	China	58,46	YES			
China, Taiwan	671	China, Taiwan	18,56	YES		NO	
Colombia	1	Colombia	577,46	NO	2010		
Finland	1	Finland	1237,93	NO	2006		
France	7	France	2324,88	YES	2017		
Germany	10	Germany	2170,05	NO	2007		
India	3	India	138,07	YES		YES	2005-2011
Indonesia	2	Indonesia	96,79	YES			
Italy	4	Italy	3853,99	YES		YES	
Kuwait	1	Kuwait	6332,42	NO	2014		
Malaysia	5	Malaysia	241,58	YES	2016	NO	
Mongolia	9	Mongolia	56,43	YES	2006		
New Zealand	1	New Zealand	239,31	YES	2012		
Philippines	14	Philippines	165,05	YES	2005	NO	
Republic of Ireland	1	Republic of Ireland	5060,96	YES	2006	YES	
Republic of Korea	3	Republic of Korea	224,36	YES	2012	NO	
Romania	1	Romania	1001	NO		NO	
Russian Federation	1	Russian Federation	2780,99	NO	2006		
Singapore	206	Singapore	5962,73	YES	2013		
South Africa	1	South Africa	551,07	YES	2006		
Spain	1	Spain	5125,42	YES	2015	NO	
Sweden	3	Sweden	3827,6	NO	2014		
Switzerland	1	Switzerland	3556,37	YES	2009	NO	
Thailand	9	Thailand	44,14	YES	2015		
United Kingdom	4	United Kingdom	3763,88	YES		NO	
United States	75	United States	5408,39	YES	2018	YES	
Viet Nam	63	Viet Nam	3,37	YES	2019		

8.1.9 Indicators benchmarking



OECD = Organization for Economic Cooperation and Development.

8.1.10 European and EU countries availability of preparedness and response plans

Countries	Plans English WHO	ECDC
Austria	YES	
Belgium	YES	
Bulgaria	NO	NO
Croatia	YES	
Cyprus	NO	NO
Czech	YES	
Denmark	NO	NO
Estonia	YES	
Finland	NO	NO
France	YES	

Germany	NO	NO
Greece	NO	NO
Hungary	NO	NO
Ireland	YES	
Italy	YES	
Latvia	NO	NO
Lithuania	NO	NO
Luxembourg	NO	NO
Malta		YES
Poland	NO	NO
Portugal	NO	NO
Romania	NO	NO
Slovakia	NO	NO
Slovenia	NO	NO
Spain	YES	
Sweden	NO	NO
The Netherlands	YES	YES
United Kingdom	YES	YES

Countries	Plan English WHO	ECDC
Austria	YES	
Belgium	YES	
Croatia	YES	
Czech	YES	

Estonia	YES	
France	YES	
Ireland	YES	
Italy	YES	
Malta		YES
Spain	YES	
The Netherlands	YES	
United Kingdom	YES	

8.1.11 Scoring tool Droogers et.al., (2019)

Theme	Item	Description	Score	Remarks
Preparedness planning	1 Simulation exercises	The plan refers to simulation exercises.		
	2 National planning committee	The plan refers to a national planning/preparedness committee.		
	3 Evaluation methodology	The plan includes a methodology to evaluate the pandemic mitigation measures		
Strategic planning	4 Activation/de-escalation triggers	The plan refers to defined, country-specific triggers for activation and de-escalation of mitigation measures.		
	5 Ethical aspects	The plan discusses and describes ethical aspects of mitigation measures		
	6 Planning assumptions	The plan includes a range of realistic, country-specific planning assumptions		
Risk-based planning	7 Risk assessment capacity	The plan refers to capacity and processes to perform national and subnational risk assessments		
	8 National surveillance and monitoring	The plan refers to a national surveillance system to collect and analyze epidemiological and virological data (e.g., virology, risk groups, transmission, clinical severity, vaccination uptake, antiviral consumption).		
	9 Differentiated response planning	The plan considers the possibility of differentiated responses depending on the situation severity.		

Command control, coordination & monitoring	10 Crisis management system	The plan describes activation of health sector and multisectoral crisis management systems.		
	11 Decision-making data requirements	The plan defines information requirements for decision-making.		
	12 Technical advice for decision-making links	The plan describes the crisis management system links to technical and decision-making levels		
Risk communication	13 Communications strategy	The plan describes the need for a communication strategy for the preparedness and response phases.		
	14 Communication channels	The plan refers to strategies for targeting pandemic communications to different groups		
	15 Cross-border communication coordination	The plan describes methods to coordinate communication with neighboring countries (e.g., the Early Warning and Response System of the European Union)		
Early warning, risk assessment & surveillance	16 Investigation of first cases	The plan specifies the approach for rapid investigation of the first indigenous cases.		
	17 Routine seasonal surveillance	The plan refers to the availability of sustainable, routine seasonal influenza surveillance that can be adapted to pandemic requirements.		
	18 Surveillance feedback	The plan describes the processes to provide feedback to surveillance stakeholders and others		
	19 Adaptable laboratory surveillance	The plan describes differential laboratory testing depending on the situation severity (e.g., decreasing testing as the pandemic evolves).		
Vaccines	20 Vaccine policy	The plan refers to a strategy for use of pandemic vaccine (e.g., procurement, distribution, storage, and policy).		
	21 Vaccine uptake and adverse events	The plan refers to a system for monitoring vaccine uptake and adverse events.		
	22 Vaccine effectiveness	The plan identifies a mechanism to monitor pandemic vaccine effectiveness.		

Antivirals & other essential medicines	23 Antiviral policy	The plan refers to a strategy for use of antivirals during a pandemic (e.g., procurement, distribution, storage, and policy).		
	24 Antiviral adverse events	The plan describes a system for rapid detection and monitoring of pharmaceutical adverse events or side effects		
	25 Other essential medicines	The plan foresees an increased need for other medicines (e.g., antibiotics, nonsteroidal anti-inflammatory drugs).		
Health care system preparedness and response	26 Existing health care capacity awareness	The plan identifies the need for awareness of health care capacities at the time of activation.		
	27 Surge capacity	The plan describes surge capacity for laboratory tests and patient care		
	28 Health care information exchange	The plan proposes establishment of a network of clinicians, nurses, public health authorities, and health care authorities for frequent and rapid information exchange.		
Nonpharmaceutical public health interventions (NPIs)	29 NPI policy	The plan refers to a policy describing the relevant NPIs.		
	30 NPI communication strategy	The plan refers to a strategy to communicate NPIs to the public and other target groups		
Essential services & business continuity	31 Essential services identification	The plan identifies essential public and private services.		
	32 Health business continuity	The plan requires the ministry of health, key public health agencies, and major health facilities to have business continuity plans.		
	33 Vulnerable group support	The plan refers to identified methodologies to support vulnerable groups (e.g., at-risk patient groups).		
Special groups and settings	34 Business and workplace preparedness	The plan refers to preparedness/business continuity for businesses and workplaces		
	35 Vulnerable populations	The plan refers to specific actions for migrants, persons in transit, and hard-to-reach populations		

	36 Third sector engagement	The plan describes roles for third sector organizations: nongovernmental organizations, volunteer organizations, or community-based organizations (e.g., Red Cross and aid organizations).		
Recovery and transition phase	37 Recovery and transition	The plan describes recovery and transition activities		
	38 Triggers for recovery	The plan refers to development of risk-based triggers to identify the end of the pandemic and trigger recovery		
	39 Human resources recovery	The plan outlines the recovery for staff and responders mobilized during a pandemic		
International interoperability	40 International health regulations core capacity	The plan cross references with international health regulations for core capacity requirements.		
	41 Interoperability with neighbors	The plan describes requirements for interoperability of plans with neighboring countries		
	42 International communication	The plan outlines communication strategies with international organizations		
Score				

8.1.12 NPI checklist ECDC

ECDC	present	Not present	remarks
• A national list of NPIs based on evidence, international guidance and best practice – all likely to be effective and feasible for the setting/country – are included in the pandemic plan. Their implementation and timing depend on the actual situation and severity in a pandemic. The main goals of NPIs are to delay and reduce the number of cases and severe or fatal outcomes.			
• As a minimum, the public will be informed about the measures they can take to protect themselves and others from getting ill, i.e., by applying universal hygiene measures, such as frequent handwashing and cough etiquette. Such			

information is part of seasonal influenza campaigns and is re-emphasised in a pandemic.			
• Social distancing measures, including closure of schools, pre-schools and other educational institutions, banning of mass gatherings, adjusted working patterns, or advising contacts of cases to reduce their social interactions, are considered.			
• Advice for travellers is given.			
• There are mechanisms for communicating with those who will implement the measures and those that will be affected, e.g., parents and teachers by school closures, and both the mechanisms and messages have been tested.			
• The benefit–cost ratio and feasibility of NPIs has been calculated and assessed in advance. The legal and ethical ramifications and effects of NPIs have been taken into account in planning and appropriate risk mitigation strategies have been considered.			
• The scientific evidence for the effects has been weighed against socio-political considerations and their negative impact.			
• The pandemic plan identifies triggers that determine when a particular measure will be implemented and terminated.			
• Mechanisms for monitoring the effects/effectiveness of NPIs have been identified.			
• Off-the-shelf research protocols with prior ethical and review board approvals implemented in order to study the effectiveness and response to non-pharmaceutical countermeasures.			

8.1.13 the scoring tool with search terms Droogers et al. (2019)

Theme	Item	Control F word	Synonyms
Preparedness planning	1 Simulation exercises	The plan refers to **simulation exercises**.	
	2 National planning committee	The plan refers to a **national planning/preparedness committee**.	Board

	3 Evaluation methodology	The plan includes a **methodology** to **evaluate** the pandemic mitigation measures	
Strategic planning	4 Activation/de-escalation triggers	The plan refers to defined, country-specific **triggers** for activation and de-escalation of **mitigation measures**.	
	5 Ethical aspects	The plan discusses and describes **ethical** aspects of mitigation measures	
	6 Planning assumptions	The plan includes a range of realistic, country-specific **planning assumptions**	
Risk-based planning	7 Risk assessment capacity	The plan refers to capacity and processes to perform national and subnational **risk assessments**	
	8 National surveillance and monitoring	The plan refers to a **national surveillance system** to collect and analyze epidemiological and virological data (e.g., virology, risk groups, transmission, clinical severity, vaccination uptake, antiviral consumption).	
	9 Differentiated response planning	The plan considers the possibility of **differentiated responses** depending on the situation severity.	Differ*
Command control, coordination & monitoring	10 Crisis management system	The plan describes activation of **health sector** and **multisectoral crisis management systems**.	Synonym health sector
	11 Decision-making data requirements	The plan defines information **requirements** for **decision-making**.	
	12 Technical advice for decision-making links	The plan describes the **crisis management** system links to technical and decision-making levels	
Risk communication	13 Communications strategy	The plan describes the need for a **communication strategy** for the preparedness and response phases.	Risk communication
measures	14 Communication channels	The plan refers to strategies for targeting **pandemic communications** to different groups	Risk Communication
	15 Cross-border communication coordination	The plan describes methods to coordinate **communication** with neighboring countries (e.g., the Early Warning and Response System of the European Union)	
Early warning, risk	16 Investigation of first cases	The plan specifies the approach for **rapid investigation** of the **first indigenous cases**.	

assessment & surveillance			
	17 Routine seasonal surveillance	The plan refers to the availability of sustainable, **routine** seasonal influenza **surveillance** that can be adapted to pandemic requirements.	Sentinel
	18 Surveillance feedback	The plan describes the processes to provide **feedback** to **surveillance** stakeholders and others	
	19 Adaptable laboratory surveillance	The plan describes differential **laboratory testing** depending on the situation severity (e.g., decreasing testing as the pandemic evolves).	
Health care system preparedness and response	26 Existing health care capacity awareness	The plan identifies the need for awareness of **health care capacities** at the time of activation.	
	27 Surge capacity	The plan describes **surge capacity** for laboratory tests and patient care	
	28 Health care information exchange	The plan proposes establishment of a **network** of clinicians, nurses, public health authorities, and health care authorities for frequent and rapid **information exchange**.	
Nonpharmaceutical public health interventions (NPIs)	29 NPI policy	The plan refers to a policy describing the relevant **NPI**s.	Non-pharmaceutical interventions, public health measures
	30 NPI communication strategy	The plan refers to a **strategy** to **communicate** NPIs to the public and other target groups	
Essential services & business continuity	31 Essential services identification	The plan identifies essential **public and private services.**	
organization	32 Health business continuity	The plan requires the ministry of health, key public health agencies, and major health facilities to have **business continuity** plans.	
	33 Vulnerable group support	The plan refers to identified methodologies to support **vulnerable groups** (e.g., at-risk patient groups).	Risk groups, high-risk groups
Special groups and settings	34 Business and workplace preparedness	The plan refers to **preparedness/business continuity** for businesses and workplaces	

	35 Vulnerable populations	The plan refers to specific actions for **migrants,** persons in **transit,** and **hard-to-reach** populations	remote
	36 Third sector engagement	The plan describes roles for **third sector organizations: nongovernmental organizations, volunteer organizations, or community-based organizations** (e.g., Red Cross and aid organizations).	
Score			

8.1.14 search terms ECDC tool

ECDC	Synonyms/ other search words
• **NPIs** based on **evidence**, **international guidance** and **best practice** – all likely to be effective and feasible for the setting/country – are included in the pandemic plan. Their implementation and timing depend on the actual situation and severity in a pandemic.	Public health measures
• The public will be **informed** about the measures they can take to protect themselves and others from getting ill. Such information is part **of seasonal influenza campaigns** and is re-emphasised in a pandemic.	Communication
• **Social distancing measures**, closure of schools, pre-schools and other educational institutions, banning of mass gatherings, adjusted working patterns, or advising contacts of cases to reduce their social interactions, are considered.	Public health measures
• Advice **travellers**.	Travel, tourists, flights
• **Communicating** with those who will implement the measures and those that will be affected, e.g., parents and teachers, by school closures, and both the mechanisms and messages have been **tested**.	Communication,
• The **benefit–cost ratio** and **feasibility** of **NPIs** has been calculated and assessed in advance. **Legal** and **ethical** ramifications and effects of NPIs, **risk mitigation** strategies have been considered.	
• The **scientific evidence** for the effects has been weighed against **socio-political** considerations and their negative impact.	

• Identifies **triggers** that determine when a particular measure will be **implemented** and **terminated**.	phase
• Mechanisms for **monitoring** the **effects**/**effectiveness** of **NPI**s have been identified.	Public health measures, non-pharmaceutical interventions
• **Off-the-shelf research protocols** with prior ethical and review board approvals implemented in order to study the effectiveness and response to non-pharmaceutical countermeasures.	

8.1.15 Technical guidelines

Preparing for an emergency

According to the WHO (2018), the following elements should be covered in NPPRP's in the section 'preparing for an emergency': Planning, coordination and resources, Response planning, Coordination, Resources, Legal and policy issues, Ethical issues, Risk communication and community engagement, Points of entry, Travel restrictions.

Planning, coordination and resources

A clear division of tasks and recourses is essential when dealing with a pandemic. Ensuring that actors are aware of their roles and responsibilities, have both the capacities and resources, understand their role in the plan, and work together, requires involvement in the planning process (World Health, 2018). Therefore, strategic planning at the national level must identify and involve key stakeholders from all sectors (ECDC,2017). The majority of operational response in a country regarding pandemics takes place at the subnational level. Therefore, well-developed pandemic preparedness plans at the subnational level and local operational plans must be effective. (ECDC, 2017). In many countries, non-governmental, academic, and private institutions play an essential part in public health. Therefore, they should be included in NPRP. The presence of specific communication channels and coordination and pre-established consensus on decision-making and leadership benefits proper execution.(Khan, Rifay, Malik, & Kayali, 2019).

Legal and policy issues

Differences between countries occur in plans, whether the content described is a legal act or a law. It could also occur that the ministry of health provides the national plan. National pandemic plans vary from being a legal act or law in some countries to an internal planning document by the ministry of health in others. (ECDC, 2017). According to Bennett & Carney (2010), the WHO described the law as a crucial component when creating sound national policies that address pandemics and underscores the necessity of a legal framework to guarantee transparent assessment and justification of the considered measures. The goal of community health might require overruling existing laws or (individual) human rights to implement measures. However, a legal framework should ensure coherence with the International Health Regulations (WHO, 2018).

Ethical issues

Ethical issues are, in their turn, essential when developing legal frameworks that are targeted at pandemics. These come into play when taking into account the cultural acceptability of intended measures like quarantine. The WHO guidelines leave room for national approaches in line with cultural or institutional variabilities (Bennett & Carney, 2010). According to the WHO (2018), policy decisions can cause friction between the goal of protecting health on the one hand and individual rights and freedom on the other.

Risk communication

According to the ECDC (2017), Risk communication is a crucial public health tool in pandemic planning and response to a pandemic. Mainly because it intends to build up a certain degree of confidence and trust, although it is mainly directed at the public, key stakeholders and health workers rely on adequate risk communication. The CDC (2017) states that pandemics can be characterized as a series of outbreaks; therefore, messaging should be based on time and location and based on risk communication principles. These principles can enhance public confidence in the national public health system. This is needed because mainly early in the pandemic) prevention and mitigation messages might be delivered even though complete information might be lacking. The WHO states that plans should elaborate, in detail, which communication methods are to be used. This should include communicating with the public, care providers and other stakeholders (Khan et al., 2019). Timely and concise communications will enable communities to understand the health risks they face (WHO, 2018).

Points of entry and travel restrictions

Points of entry are all the options one has to enter or leave a nation. Under the International Health Regulations of 2005, it is determined that countries should have designated key points of entry. These should be strengthened and process capacities to prevent, prepare for and respond to public health risks (WHO,2018).

Risk management and risk assessment

National risk assessments should be guided by global and European risk assessments (ECDC, 2017). The WHO guide on pandemic influenza risk management considers four phases, which do not necessarily specify country-specific action. Countries are stimulated to conduct their own risk assessment on which to base risk management. These phases are categorized into: the interpandemic phase, the alert phase, the pandemic phase and the transition phase (WHO, 2018). Countries might encounter non-identical risks and are therefore encouraged to develop their own risk assessment guided by local circumstances, which in turn guides risk management and adaptability to different phases. (Wijesinghe et al., 2020).

Surveillance

Pandemic responses will be based on surveillance, which is essential to provide information to pandemic preparedness (WHO, 2018; CDC,2017).
All of the national documents should describe their current epidemiologic surveillance system. Furthermore, they should describe surveillance expands during a pandemic. The capacity for laboratory surveillance is mentioned as an important factor for success. to success. Surge capacity should be identified, and testing should be dramatically increased to cover the diagnosis of disease. Countries must clearly state which laboratories will be utilized and are encouraged to include research and private laboratories with influenza capacity. Logistics should also be described (Khan et al., 2019).

Preventing illness in the community

Non-pharmaceutical interventions are the first line of defence in influenza pandemics and a critical element of pandemic preparedness (WHO,2017; CDC,2017, ECDC,2017). The effective

implementation relies on public awareness, acceptance, intersectoral collaboration (WHO,2018) and, according to the ECDC (2017), planning and proper communication. However, countries should consider the acceptability, feasibility, and legal frameworks in their plans since a solid foundation of evidence lacks for many NPI's (ECDC,2017). Plans should also elaborate on intended infection control policies, border screening, quarantine facilities and insights on transmission and infection control in the community and its communication (Khan et al., 2019).

Maintaining essential services and recovery

Communities require access to essential services to keep up welfare and stability in times of a pandemic (WHO, 2018; ECDC, 2017). Pandemics usually consist of two or three waves of national and global spread. Therefore, pandemic recovery actions should be balanced by preparedness activities to prepare for possible subsequent waves (WHO, 2018).

Evaluation, testing and revising plans.

Evaluation provides essential information regarding the effectiveness of pandemic preparedness, response and recovery activities. It provides insights into current resources and needed reallocations to improve future actions. It enhances awareness in planners and personnel of what does work what does not, and identifies potential (unintended) consequences. The process of evaluation is a crucial part of pandemic operations. By facilitating reviews and by learning, interventions can be swiftly adapted to the altered situation. These processes should be established or adapted from existing processes before a pandemic, being operational when needed. The national public health emergency or pandemic preparedness and response is considered a crucial document for handling an influenza pandemic. It is advised to be regularly tested, ensuring that planning assumptions and organizational relationships are valid and working (WHO, 2018).

According to the ECDC (2017), "Pandemic preparedness is most effective if it is built on general principles that guide preparedness planning for any acute threat to public health". A national pandemic response plan is a "living document' since it is, or is advised to be, frequently reviewed and revised. Preparation is a 'continuous process of planning, exercising, revising and translating into action" (ECDC, 2017). The key elements of the pandemic preparedness planning cycle are shown in Figure 1.
Plans should clearly mention simulations and exercises. Lessons learned from such exercises would help improve pandemic preparedness plans(Khan et al., 2019).

Figure 20:Key elements of the pandemic planning cycle
(ECDC, 2017)

8.1.16 Item scores South Korea, Vietnam and Singapore

Table 13: Scores South Korea Vietnam, and Singapore

Theme	Item	South Korea	Vietnam	Singapore
Preparedness planning	1 Simulation exercises planning	1	1	0
	2 National planning committee	1	1	1
	3 Evaluation methodology	0	1	0
Strategic planning	4 Activation/de-escalation triggers	1	0	1
	5 Ethical aspects	0	0	0
	6 Planning assumptions	1	0	1
Risk-based planning	7 Risk assessment capacity	1	0	1
	8 National surveillance and monitoring	1	1	1
	9 Differentiated response planning	1	0	1
Command control, coordination &	10 Crisis management system	1	0	1
	11 Decision-making data requirements	0	0	1
	12 Technical advice for decision-making links	0	0	1
Risk communication	13 Communications strategy	1	1	0
	14 Communication channels	0	1	0
	15 Cross-border communication coordination	1	1	0
Early warning, risk assessment & s	16 Investigation of first cases	1	1	1
	17 Routine seasonal surveillance	1	1	1
	18 Surveillance feedback	1	1	1
	19 Adaptable laboratory surveillance	1	1	0
Health care system preparedness	26 Existing health care capacity awareness	1	1	0
	27 Surge capacity	0,5	1	0
	28 Health care information exchange	1	0,5	0
Nonpharmaceutical public health i	29 NPI policy	1	0	1
	30 NPI communication strategy	1	1	0
Addition NPI ECDC	• A national list of NPIs based on e	0,5	0	1
	• Social distancing measures, inclu	1	0	1
	Advice for travellers is given.	1	0	1
	• There are mechanisms for comm	0,5	0,5	0
	• The benefit–cost ratio and feasib	0	0	0
	The legal and ethical ramifications an	0,5	0	0
	• The scientific evidence for the eff	0	0	0
	• The pandemic plan identifies trigg	1	0	0
	• Mechanisms for monitoring the e	0	0	0
	• Off-the-shelf research protocols	0	0	0
Essential services & business cont	31 Essential services identification	0,5	0	0
	32 Health business continuity	1	1	1
	33 Vulnerable group support	1	0	0
Special groups and settings	34 Business and workplace preparedness	0,5	1	1
	35 Vulnerable populations	0	0	0
	36 Third sector engagement	0	1	0
Score		26	18	18

8.1.17 Item scores UK, Germany and Belgium

Table 14: scores UK and Belgium

		Score (own assesmer	
Theme	**Item**	**UK**	**Belgium**
Preparedness planning	1 Simulation exercises planning	0	1
	2 National planning committee	1	1
	3 Evaluation methodology	0,5	0
Strategic planning	4 Activation/de-escalation triggers	1	0
	5 Ethical aspects	1	0
	6 Planning assumptions	1	0
Risk-based planning	7 Risk assessment capacity	0,5	0
	8 National surveillance and monitoring	1	1
	9 Differentiated response planning	1	0,5
Command control, coordination &	10 Crisis management system	0	1
	11 Decision-making data requirements	0	0
	12 Technical advice for decision-making links	1	1
Risk communication	13 Communications strategy	1	1
	14 Communication channels	1	1
	15 Cross-border communication coordination	1	1
Early warning, risk assessment & s	16 Investigation of first cases	0,5	1
	17 Routine seasonal surveillance	1	1
	18 Surveillance feedback	1	1
	19 Adaptable laboratory surveillance	0	1
Health care system preparedness	26 Existing health care capacity awareness	1	1
	27 Surge capacity	1	1
	28 Health care information exchange	0	1
Nonpharmaceutical public health i	29 NPI policy	1	0,5
	30 NPI communication strategy	1	1
Addition NPI ECDC	• A national list of NPIs based on e	1	0
	• Social distancing measures, inclu	1	0,5
	Advice for travellers is given.	1	0,5
	• There are mechanisms for comm	1	0
	• The benefit–cost ratio and feasib	0	0
	The legal and ethical ramifications an	1	0
	• The scientific evidence for the eff	1	0
	• The pandemic plan identifies trig	0	0
	• Mechanisms for monitoring the e	0	0,5
	• Off-the-shelf research protocols	0	0
Essential services & business cont	31 Essential services identification	1	0,5
	32 Health business continuity	1	0
	33 Vulnerable group support	1	0
Special groups and settings	34 Business and workplace preparedness	1	0,5
	35 Vulnerable populations	0	0,5
	36 Third sector engagement	0	0
Score		27,5	20

Table 15: scores of the UK, Belgium and Germany from the research of Droogers et al. (2019)

Theme	Item	UK	Belgium	Germany	Horizontal scores
Preparedness planning	1 Simulation exercises planning	1	1	1	3
	2 National planning committee	1	1	1	3
	3 Evaluation methodology	1	1	1	3
Strategic planning	4 Activation/de-escalation triggers	1	1	0	2
	5 Ethical aspects	1	1	1	3
	6 Planning assumptions	1	1	1	3
Risk-based planning	7 Risk assessment capacity	1	0	0	1
	8 National surveillance and monitoring	1	1	1	3
	9 Differentiated response planning	1	1	1	3
Command control, coordination &	10 Crisis management system	1	1	1	3
	11 Decision-making data requirements	1	1	1	3
	12 Technical advice for decision-making links	1	1	1	3
Risk communication	13 Communications strategy	1	1	1	3
	14 Communication channels	1	1	1	3
	15 Cross-border communication coordination	1	1	1	3
Early warning, risk assessment & s	16 Investigation of first cases	1	1	0	2
	17 Routine seasonal surveillance	1	1	1	3
	18 Surveillance feedback	1	1	1	3
	19 Adaptable laboratory surveillance	1	1	1	3
Health care system preparedness	26 Existing health care capacity awareness	1	1	0	2
	27 Surge capacity	1	0	1	2
	28 Health care information exchange	1	1	0	2
Nonpharmaceutical public health	29 NPI policy	1	1	1	3
	30 NPI communication strategy	1	1	0	2
Addition NPI ECDC	• A national list of NPIs based on e				
	• Social distancing measures, inclu				
	Advice for travellers is given.				
	• There are mechanisms for comm				
	• The benefit–cost ratio and feasib				
	The legal and ethical ramifications an				
	• The scientific evidence for the eff				
	• The pandemic plan identifies trig				
	• Mechanisms for monitoring the e				
	• Off-the-shelf research protocols				
Essential services & business cont	31 Essential services identification	1	0	0	1
	32 Health business continuity	1	1	1	3
	33 Vulnerable group support	1	0	1	2
Special groups and settings	34 Business and workplace preparedness	1	0	1	2
	35 Vulnerable populations	0	0	1	1
	36 Third sector engagement	1	0	0	1
Score		29	23	22	

8.1.18 Item scores all countries

Table 16: scores of the two groups

		Score (own assesment using tool Droogers and ECDC NPI)					
Theme	**Item**	**Item scores total**	**Scores Asia**	**Scores Euro**	**Category total**	**Category asia**	**Category Europe**
Preparedn	1 Simulation exercises planning	4	2	2	12,5	6	6,5
	2 National planning committee	6	3	3			
	3 Evaluation methodology	2,5	1	1,5			
Strategic p	4 Activation/de-escalation triggers	3	2	1	9	4	5
	5 Ethical aspects	2	0	2			
	6 Planning assumptions	4	2	2			
Risk-basec	7 Risk assessment capacity	2,5	2	0,5	13	7	6
	8 National surveillance and monitoring	6	3	3			
	9 Differentiated response planning	4,5	2	2,5			
Command	10 Crisis management system	4	2	2	10	4	6
	11 Decision-making data requirements	2	1	1			
	12 Technical advice for decision-making links	4	1	3			
Risk comm	13 Communications strategy	5	2	3	14	5	9
	14 Communication channels	4	1	3			
	15 Cross-border communication coordination	5	2	3			
Early warn	16 Investigation of first cases	4,5	3	1,5	20,5	11	9,5
	17 Routine seasonal surveillance	6	3	3			
	18 Surveillance feedback	6	3	3			
	19 Adaptable laboratory surveillance	4	2	2			
Health car	26 Existing health care capacity awareness	4	2	2	11	5	6
	27 Surge capacity	4,5	1,5	3			
	28 Health care information exchange	2,5	1,5	1			
Nonpharm	29 NPI policy	4,5	2	2,5	8,5	4	4,5
	30 NPI communication strategy	4	2	2			
Addition N	· A national list of NPIs based on evidence,	2,5	1,5	1	15,5	8	7,5
	· Social distancing measures, including clos	3,5	2	1,5			
	Advice for travellers is given.	3,5	2	1,5			
	· There are mechanisms for communicating	2	1	1			
	· The benefit–cost ratio and feasibility of N	0	0	0			
	The legal and ethical ramifications and effects	1,5	0,5	1			
	· The scientific evidence for the effects has	1	0	1			
	· The pandemic plan identifies triggers that	1	1	0			
	· Mechanisms for monitoring the effects/e	0,5	0	0,5			
	· Off-the-shelf research protocols with prio	0	0	0			
Essential s	31 Essential services identification	2	0,5	1,5	10	4,5	5,5
	32 Health business continuity	5	3	2			
	33 Vulnerable group support	3	1	2			
Special gro	34 Business and workplace preparedness	5	2,5	2,5	7,5	3,5	4
	35 Vulnerable populations	1,5	0	1,5			
	36 Third sector engagement	1	1	0			

Table 17: All scores

		Score (own assesment using tool Droogers and ECDC NPI												used in the research from Droogers et.			
Theme	**Item**	**South Korea**	**Vietnam**	**Singapore**	**UK**	**Belgium**	**Germany**	**horizontal scores total**	**Scores Asia**	**Scores Europe**	**Category total**	**Category asia**	**Category Europe**	**UK**	**Belgium**	**Germany**	**Horizontal scores**
Preparedness planning	1 Simulation exercises planning	1	1	0	0,5	1		4,5	2	2,5	13	6	7	1	1	1	3
	2 National planning committee	1	1	1	1	1		6	3	3				1	1	1	3
	3 Evaluation methodology	0	1	0	0,5	0		2,5	1	1,5				1	1	1	3
Strategic planning	4 Activation/de-escalation triggers	1	0	1	1	0		3	2	1	9	4	5	1	1	0	2
	5 Ethical aspects	0	0	0	1	0		2	0	2				1	1	1	3
	6 Planning assumptions	1	0	1	1	0		4	2	2				1	1	1	3
Risk-based planning	7 Risk assessment capacity	1	0	1	0,5	0		2,5	2	0,5	13	7	6	1	0	0	1
	8 National surveillance and monitoring	1	1	1	1	1		6	3	3				1	1	1	3
	9 Differentiated response planning	1	0	1	1	0,5		4,5	2	2,5				1	1	1	3
Command control, coordination &	10 Crisis management system	1	0	1	0	1		4	2	2	10	4	6	1	1	1	3
	11 Decision-making data requirements	0	0	1	0	0		2	1	1				1	1	1	3
	12 Technical advice for decision-making links	0	0	1	1	1		4	1	3				1	1	1	3
Risk communication	13 Communications strategy	1	1	0	1	1		5	2	3	14	5	9	1	1	1	3
	14 Communication channels	0	1	0	1	1		4	1	3				1	1	1	3
	15 Cross-border communication coordination	1	1	0	1	1		5	2	3				1	1	1	3
Early warning, risk assessment & s	16 Investigation of first cases	1	1	1	0,5	1		4,5	3	1,5	20,5	11	9,5	1	1	0	2
	17 Routine seasonal surveillance	1	1	1	1	1		6	3	3				1	1	1	3
	18 Surveillance feedback	1	1	1	1	1		6	3	3				1	1	1	3
	19 Adaptable laboratory surveillance	1	1	0	0	1		4	2	2				1	1	1	3
Health care system preparedness	26 Existing health care capacity awareness	1	1	0	1	1		4	2	2	11	5	6	1	1	0	2
	27 Surge capacity	0,5	1	0	1	1		4,5	1,5	3				1	0	1	2
	28 Health care information exchange	1	0,5	0	0	1		2,5	1,5	1				1	1	0	2
Nonpharmaceutical public health	29 NPI policy	1	0	1	1	0,5		4,5	2	2,5	8,5	4	4,5	1	1	1	3
	30 NPI communication strategy	1	1	0	1	1		4	2	2				1	1	0	2
Addition NPI ECDC	• A national list of NPIs based on e	0,5	0	1	1	0		2,5	1,5	1	15,5	8	7,5				
	• Social distancing measures, inclu	1	0	1	1	0,5		3,5	2	1,5							
	Advice for travellers is given.	1	0	1	1	0,5		3,5	2	1,5							
	• There are mechanisms for comm	0,5	0,5	0	1	0		2	1	1							
	• The benefit–cost ratio and feasib	0	0	0	0	0		0	0	0							
	The legal and ethical ramifications an	0,5	0	0	1	0		1,5	0,5	1							
	• The scientific evidence for the eff	0	0	0	1	0		1	0	1							
	• The pandemic plan identifies trig	1	0	0	0	0		1	1	0							
	• Mechanisms for monitoring the e	0	0	0	0	0,5		0,5	0	0,5							
	• Off-the-shelf research protocols	0	0	0	0	0		0	0	0							
Essential services & business cont	31 Essential services identification	0,5	0	0	1	0,5		2	0,5	1,5	10	4,5	5,5	1	0	0	1
	32 Health business continuity	1	1	1	1	0		5	3	2				1	1	1	3
	33 Vulnerable group support	1	0	0	1	0		3	1	2				1	0	1	2
Special groups and settings	34 Business and workplace preparedness	0,5	1	1	1	0,5		5	2,5	2,5	7	3,5	3,5	1	0	1	2
	35 Vulnerable populations	0	0	0	0	0		1	0	1				0	0	1	1
	36 Third sector engagement	0	1	0	0	0		1	1	0				1	0	0	1
Score		26	18	18	28	19,5								29	23	22	
Total		22/39	18/39														
Pages		193	165	32	70												
Year		2006	2011	2014	2011												
Updated																	